DMSO
PRODUCTION AND LOGISTICS FUNCTIONAL WORKING GROUP WORKSHOP

PROCEEDINGS

16 - 18 NOVEMBER 1992

MCLEAN, VA

REPORT DOCUMENTATION PAGE

Form Approved
OMB No 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	2 April 1993	Final, 16-18 November 1992

4. TITLE AND SUBTITLE

DMSO Production and Logistics Functional Working Group Workshop Proceedings, 16-18 November 1992

5. FUNDING NUMBERS

PR 88600

6. AUTHOR(S)

Howard J. Carpenter, Project Leader

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

The MITRE Corporation
7525 Colshire Drive
McLean, VA 22102

8. PERFORMING ORGANIZATION REPORT NUMBER

N/A

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

The Defense Modeling and Simulation Office
1901 N. Beauregard St., Suite 501
Alexandria, VA 22311

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

N/A

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release.
Distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT (*Maximum 200 words*)

During 1992, a series of workshops was conducted in support of the Defense Modeling and Simulation Office (DMSO) to determine the modeling and simulation (M&S needs of the defense M&S community. This community is partitioned into five major areas: Education, Training and Military Operations (ETMO), Research and Development (R&D), Test and Evaluation (T&E), Production and Logistics (P&L), and Analysis. Each of these areas has a Functional Working Group (FWG) representing its interests to the DMSO and other interested parties. Workshops were conducted to assist the FWGs in determining the "requirements pull" to be considered in the development of the DMSO Master Plan.

This report presents the results of the Productions and Logistics Workshop in developing Modeling and Simulation needs for the P&L community. The executive summary provides an overview of the background, objectives, methodology, and organization of the workshop, and presents a summary of key findings of the workshop. The body presents the workshop background and objectives, describes the working groups and workshop process, and presents the results of the three-day workshop.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Modeling, simulation, production, logistics, workshop, needs	174
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Unlimited

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

REPORT ORGANIZATION

This report presents the results of the Productions and Logistics Workshop in developing Modeling and Simulation needs for the P&L community. The executive summary provides an overview of the background, objectives, methodology, and organization of the workshop, and presents a summary of key findings of the workshop. The body presents the workshop background and objectives, describes the working groups and workshop process, and presents the results of the three-day workshop.

The appendices contain hardcopies of the briefing material used for the initial and final workshop briefings, together with other pertinent material. Appendix A contains a copy of the workshop announcement. Appendix B presents the viewgraphs used by the chairman in his opening remarks to the workshop. Appendix C contains a list of the workshop participants and their addresses. The viewgraphs used for the initial briefings on service and agencies requirements presented on the first day of the workshop are contained in Appendices D through K for the Air Force, Army, Defense Logistics Agency, Defense Mapping Agency, Marine Corps, and Navy. Appendix L contains a copy of a white paper on Production and Logistics, prepared before the workshop and used as a reference during the workshop. Appendices M and N contain the Integrated Logistics and Production Requirements, respectively, as briefed in the workshop final session. Observations made during that final outbriefing are contained in Appendix O. Definitions of terms used in the workshop are presented in Appendix P.

EXECUTIVE SUMMARY

INTRODUCTION

The Chairman, Production and Logistics Functional Working Group, and DMSO invited the participants to the Production and Logistics Modeling and Simulation Requirements Workshop through designated Service and Defense agency points of contact.

The DMSO sponsored the Production and Logistics Modeling and Simulation Requirements Workshop as the third in a series of workshops in five functional areas (Test and Evaluation; Education, Training, and Military Operations; Production and Logistics; Research and Development; and Analysis). The output from this workshop will be used by the Production and Logistics Functional Working Group to guide the DMSO in promoting the effective and efficient use of modeling and simulation in the Department of Defense.

The workshop was conducted 16 - 18 November 1992 at the MITRE Corporation facilities in McLean, Virginia.

P&L WORKSHOP OBJECTIVES

- The primary objective of this workshop was to identify the most critical and common modeling and simulation needs of the production and logistics community.

- An additional objective was to sensitize the community to the Defense Modeling and Simulation Initiative.

METHODOLOGY/WORKSHOP ORGANIZATION

Over fifty representatives from the Services and other Defense Agencies attended the three-day workshop. The workshop was structured to allow presentations by the Services and Agencies on what they viewed to be their most critical modeling and simulation needs. Following the presentations, two working groups were established, one focused on production needs and one focused on logistics needs. The working groups were challenged to take the needs identified by the Services and Agencies and develop common or joint needs. Draft statements of modeling and simulation needs were prepared and presented to an executive panel on the last day of the workshop.

SUMMARY OF KEY FINDINGS OF THE WORKSHOP

The following summarizes the initial set of needs identified by the production and logistics working groups. A complete explanation of the need, including background and what is required to satisfy the need, can be found in the individual working group sections of this report. Note: the needs are not listed in any specific order of priority.

1. Higher fidelity representation of logistics in combat models

   There is a need within the M&S community to have a higher fidelity representation of logistics in combat models.

2. Credible logistics databases and data collection capabilities

   There is a need within the M&S community to create credible logistics databases and data collection capabilities.

3. A planning/execution tool to support the CINCs in their OPLAN assessments

   There is a need within the M&S community to provide a capability to support the CINCs in their OPLAN logistics assessments.

4. Analysis tool to study the effects of force sizing and unit realignment on the logistics infrastructure

   There is a need within the M&S community to develop an analytic capability to evaluate the effects of force sizing and unit realignment on the logistics infrastructure.

5. Acquisition Modeling

   There is a need within the M&S community for acquisition logistics models and simulations which can interface to the design process in near real time to optimize readiness and support considerations.

6. Interface between live, virtual, and constructive models

   There is a generic need within the M&S community to develop interfaces between live, virtual, and constructive models.

7. Tools to support the logistics considerations in the PPBS process

   There is a need to develop the requisite tools to support logistics considerations in the Planning, Programming, Budgeting System (PPBS) process.

8. Capability to quantify the implications of alternative materiel management policies

   There is a need within the P&L M&S community to develop the capability to quantify the implications of alternative materiel management policies.

9. Analysis capability to evaluate NDI/COTS equipment performance prior to purchase

   There is a need within the acquisition community to evaluate Non-Developmental Items/Commercial-off-the-Shelf (NDI/COTS) equipment performance against military specification equipment performance prior to purchase.

10. Production/manufacturing tools for Integrated Product and Process Development (IPPD)

    There is a need to develop a variety of production/manufacturing tools and models that will support Integrated Product and Process Development and that will interface with the synthetic battlefield through an electronic media.

11. Technical process and data models: production control and shop floor control models

    There is a need to develop a flexible, real-time production schedule and shop floor modeling capability. To meet the virtual reality need, there is a requirement to develop and use virtual reality techniques in manufacturing process design.

12. Models and simulation support of DOD and repair

    There is a need for models and simulations that will support the reverse engineering of parts for manufacturing.

13. Coordination with national and international M&S standardization efforts

    There is a need to develop and use models that conform to the standards established by national and international standardization efforts.

14. Policy and management; direction on standardization of M&S

    There is a need to sensitize the P&L community to the modeling and simulation program, enforce conformance to standards and to define return on investment for P&L model development and science and technology funding priorities.

15. Industrial Base Reconstitution

The need exists for a capability to identify materials, labor skills, equipments or technologies that may be required for reconstitution and an ability to model the planning associated with reconstitution needs.

INTRODUCTION

INTRODUCTION

The Defense Modeling and Simulation Office (DMSO) sponsored the Production and Logistics (P&L) Modeling and Simulation Workshop, reported in this document, as a forum to identify P&L modeling and simulation requirements.

The vision for modeling and simulation (M&S) support to P&L includes capabilities that can be achieved in the next ten years to make engineering and manufacturing processes significantly more versatile and cost effective. The vision encompasses an evolution of continuous test and validation of engineering technologies with the support of M&S. In the future, both development and testing will consist of significantly more simulation and significantly less hardware and or field testing. Virtual reality will be a reality.

It is foreseen that the results of this workshop will be useful in the development of a rationalized M&S development plan that will quickly and cost effectively bring about the "vision" of M&S support to P&L.

BACKGROUND

- **Invitation to P&L Modeling and Simulation Workshop from the Chairman, Production and Logistics FWG and the DMSO**
- **P&L Modeling and Simulation Workshop is third of five workshops sponsored by DMSO**
- **Participants of P&L Modeling and Simulation Workshop identified actions required to produce better modeling and simulation support to P&L**
  - **Production**
  - **Logistics**

BACKGROUND

The Chairman, Production and Logistics FWG, and DMSO invited the participants (see Appendix A) to the Production and Logistics Modeling and Simulation Requirements Workshop through designated service and agency points of contact. (The participants are listed in Appendix C.)

The DMSO sponsored the Production and Logistics Modeling and Simulation Requirements Workshop as one in a series of workshops in five functional areas (Test and Evaluation; Education, Training, and Military Operations; Production and Logistics; Research and Development; and Analysis). The output from this workshop will be used by the Production and Logistics Functional Working Group to guide the DMSO in promoting the effective and efficient use of modeling and simulation in the Department of Defense.

Participants were asked to identify and prioritize policy, management, and technical requirements. Requirements addressed activities that should be funded now and in the future.

The workshop was conducted at the MITRE Corporation facilities in McLean, Virginia during the period 16 - 18 November 1992.

WORKSHOP OBJECTIVES

- **The primary objective of this workshop was to identify the most critical and common modeling and simulation needs of the P&L community**
- **An additional objective was to sensitize the P&L community to the DMSI**

WORKSHOP OBJECTIVES

The objectives of the workshop were to identify the most critical and common modeling and simulation needs of the production and logistics community and to sensitize the community to the Defense Modeling and Simulation Initiative (DMSI).

WORKING GROUPS

- **Day 1, Session 1: Service and agency briefings**
  - **Army**
  - **Navy**
  - **Air Force**
  - **Marine Corps**
  - **DOD Agencies (Defense Logistics and Defense Mapping)**
- **Day 2, Session 2 : Functional area working groups**
  - **Production**
  - **Logistics**
- **Day 3, Session 3: Briefouts and Discussion**
  - **Production**
  - **Logistics**

WORKING GROUPS

Working groups were organized to represent Service and Agency views.

The purpose of Session 1 was to provide initial briefings on DMSO and allow services and agencies to present their critical needs for modeling and simulation support. Paper copies of the view-graphs used for presentation in this session are in Appendices D through K.

In Session 2, the participants met in work groups to discuss P&L community concerns and development needs in light of the Service and Agency views presented in Session 1. Workshops were conducted in a manner to reach consensus on needs and prioritization of those needs.

A presentation of the draft statements of models and simulation needs was made to the executive panel in Session 3.

WORKSHOP PROCESS AND PRODUCTS

- **The Production Group used a hierarchical approach to reach the needs, first identifying six areas of concern (needs), and then listing the associated expectations and specific requirements for fulfilling the expectations associated with the needs**
- **The Logistics Group utilized smaller teams to develop needs in functional areas and categorized the needs into critical, high priority and routine**
- **Both groups listed the statement of need, with a needs background and requirements for meeting the need**
- **Products of the groups will be presented by group**

WORKSHOP PROCESS AND PRODUCTS

The two groups used different approaches to reach the needs.

The Logistics Group utilized a team approach, with the smaller teams first looking at requirements in functional areas; the larger group then categorized the nine separate needs identified as to critical, high, or routine priority. The briefing slides used for the Logistics Group presentation to the Executive Panel in Session 3 are in Appendix M.

During the P&L Modeling & Simulation Workshop, the Logistics Group identified nine separate needs. Based on the urgency of need as determined by the working group, the participants grouped the needs into three categories: critical, high priority, and routine.

The Production Group utilized a hierarchical approach, beginning first with areas of concern and then identifying specific requirements associated with those needs. The briefing slides used for the Production Group presentation to the Executive Panel in Session 3 are in Appendix N.

A white paper on Production and Logistics Issues, written in preparation for the workshop, is presented in Appendix L.

Observations from the Executive Panel briefing are presented in Appendix O.

Definitions used in the workshop are included in Appendix P.

The following discussion provides a statement of each need, background of the need, and an identification of some of the key requirements which are necessary to satisfy the need. The group products will be presented, with the Logistics Group first, followed by the Production Group.

LOGISTICS CRITICAL NEED 1

Higher Fidelity Representation of Logistics in Combat Models

- **Background/Explanation**
  - **Lack of logistics considerations in combat models**
  - **Logistics actions effects not reflected in terms of combat effectiveness**
- **Requirements to satisfy need**
  - **Appropriate levels of detail and interfaces need to be established**
  - **Logistics models should identify realistic data requirements**
  - **Interplay should be realistic between combat and logistics models for planning and training purposes**

LOGISTICS CRITICAL NEED 1

Higher fidelity representation of logistics in combat models

There is a need within the M&S community to have a higher fidelity representation of logistics in combat models.

Background/Explanation of Need

Combat models, in general, do not adequately represent logistics considerations. Logistics actions, such as battle damage repair, field level maintenance, attrition and resupply, are not modeled such that the effects of these areas are reflected in terms of combat effectiveness.

Requirements to Satisfy the Need

There are three requirements which must be addressed to satisfy this need. First, the appropriate levels of detail and interfaces need to be established which consider strategic, tactical, and operational objectives. Second, the logistics models should identify realistic data requirements which can interface with combat models with the same degree of data fidelity. Third, the interplay between the combat and logistics models should be realistic enough that this product can be used as both a planning and training tool.

LOGISTICS CRITICAL NEED 2

Credible Logistics Databases and Data Collection Capabilities

- **Background/Explanation**
  - **Current logistics databases contain ill-defined, outdated, non-standard-formatted planning factors**
  - **Databases are time-consuming to prepare**
  - **Many databases have not been validated or accredited for joint applications**
- **Requirements to satisfy need**
  - **User access to and interface with credible source data on real-time basis**
  - **Standardized data definitions**

LOGISTICS CRITICAL NEED 2

Credible logistics databases and data collection capabilities

There is a need within the M&S community to create credible logistics databases and data collection capabilities.

Background/Explanation of Need

Current logistics databases most often contain logistics planning factors that are outdated, in non-standard formats, and are ill-defined. As a result, the databases are time consuming to prepare, especially across services and agencies for joint applications. The vast majority of databases that have been developed by the DOD have never been validated or accredited for joint applications in modeling and simulation.

Requirements to Satisfy the Need

The most significant database requirement is to develop an environment where a user (modeler) has access to and can interface with credible-source data on a real time basis for model design, development, and execution. In some cases this would require off-the-shelf, ready-to-use data such as in performing logistics assessments for the CINCs OPLANs. Another pressing requirement is to standardize data definitions between the Services and Defense Agencies for specific data elements and ensure consistent levels of detail are applied when this data is collected.

LOGISTICS CRITICAL NEED 3

A Planning/Execution Tool to Support the CINCs in OPLAN Assessments

- **Background/Explanation**
  - **MOEs (e.g., mobility lift, sustainment, maintenance, readiness) not adequately expressed**
  - **Comprehensive model doesn't exist to identify critical logistics shortfalls**
- **Requirements to satisfy need**
  - **Capability to quantitatively assess logistics capabilities/shortfalls**
  - **Family or series of models to clearly identify problems items or processes**

LOGISTICS CRITICAL NEED 3

A planning/execution tool to support the CINCs in their OPLAN assessments

There is a need within the M&S community to provide a capability to support the CINCs in their OPLAN logistics assessments.

Background/Explanation of Need

Historically the logistics community has not adequately expressed measures for mobility lift, sustainment, maintenance, material sourcing, or medical readiness. Additionally, a comprehensive model is not known to exist which assesses appropriate data inputs from the services and defense agencies to identify critical logistics shortfalls.

Requirements to Satisfy the Need

To satisfy this need, a capability is needed to quantitatively assess the logistics capabilities/shortfalls in the deliberate and contingency/crisis planning arenas. This capability could be represented by a family or series of models, but must be at a level of detail to clearly identify problem items or processes to improve the CINCs logistics posture.

LOGISTICS HIGH PRIORITY NEED 1

An Analysis Tool to Study Effects of Force Sizing and Unit Realignment on Logistics Infrastructure

- **Background/Explanation**
  - **Current force reductions greatest since post-Vietnam**
  - **Concurrent change in mix of active and reserve forces, unit locations and major command composition**
- **Requirements to satisfy need**
  - **Capability to evaluate impacts on logistics infrastructure of changes in requirements, concepts, stockage levels, etc.**

LOGISTICS HIGH PRIORITY NEED 1

An analysis tool to study the effects of force sizing and unit realignment on the logistics infrastructure

There is a need within the M&S community to develop an analytic capability to evaluate the effects of force sizing and unit realignment on the logistics infrastructure.

Background/Explanation of Need

Currently the DOD is in the midst of the greatest force reductions since the post-Vietnam era. This includes not only a reduction in total forces but also a change in the mix of units both active and reserve, the location of these units, and the composition of major commands, such as the composite wing concept in the Air Force.

Requirements to Satisfy the Need

A capability is needed to evaluate the impacts on the logistics infrastructure to include: item requisitioning, maintenance support concepts, sparing levels in terms of war reserves, pre-positioning, mobility lift requirements, port facilities, installation services, and support personnel requirements.

LOGISTICS HIGH PRIORITY NEED 2

Acquisition Modeling

- **Background/Explanation**
  - **LSA and LORA frequently performed in isolation from the design process**
  - **Current tools don't provide means of evaluating alternative designs**

LOGISTICS HIGH PRIORITY NEED 2

Acquisition Modeling

There is a need within the M&S community for acquisition logistics models and simulations which can interface to the design process in near real time to optimize readiness and support considerations.

Background/Explanation of Need

Logistics Support Analysis (LSA) and Level of Repair Analysis (LORA) are two analytic tools that are available to the acquisition logistician to evaluate various logistics alternatives that affect all aspects of support planning. These tools, however, are frequently performed in isolation apart from the design process and also do not offer the designer a conceptual way to evaluate alternative designs in terms of reliability, maintainability, combat effectiveness, and overall logistics support.

LOGISTICS HIGH PRIORITY NEED 2 (CONT'D)

Acquisition Modeling (Cont'd)

- Requirements to satisfy need
  - Standardize data element definitions between LSA/LORA
  - Define additional data requirements
  - Integrate LSA/LORA processes
  - Develop interfaces to the system/equipment design process
  - Develop M&S tools to evaluate the R&M of alternative designs during the design process
  - Develop M&S tools to evaluate alternative maintenance and support concepts based on system design, including a man-in-the-loop capability
  - Develop the requisite interfaces to evaluate effects of readiness and support trade-offs on combat effectiveness

LOGISTICS HIGH PRIORITY NEED 2 (CONT'D)

Requirements to Satisfy the Need

There are multiple facets to satisfying this need. Currently, there are a number of analytical tools and data bases which are available to the acquisition logistician for use in the weapon system design process. Logistics Support Analysis (LSA) and Level of Repair Analysis (LORA) are two examples. These tools generally are not applied in real time in conjunction with the weapon system design process. As such, a trade-off analysis to optimize the readiness and support aspects of a weapon system or assess the effects of these changes on combat effectiveness is not possible. Identified below are some of the key requirements which would need to be addressed to satisfy this need:

- Standardize data element definitions between LSA/LORA
- Define additional data requirements
- Integrate LSA/LORA processes
- Develop interfaces to the system/equipment design process
- Develop M&S tools to evaluate the R&M of alternative designs during the design process
- Develop M&S tools to evaluate alternative maintenance and support concepts based on system design, including a man-in-the-loop capability
- Develop the requisite interfaces to evaluate effects of readiness and support trade-offs on combat effectiveness

LOGISTICS HIGH PRIORITY NEED 3

Interfaces between Live, Virtual, and Constructive Models

- **Background/Explanation**
  - **Logistics models have been principally constructive models, designed to address macro-level cargo movement**
  - **Need to examine interfaces with combat models which are designed to operate in near-real-time settings**

LOGISTICS HIGH PRIORITY NEED 3

Interfaces between live, virtual, and constructive models

There is a generic need within the M&S community to develop interfaces between live, virtual, and constructive models.

Background/Explanation of Need

In general, combat models are developed to operate in a near real-time setting to provide realistic representations of battlefield scenarios. Logistics models, however, have been principally constructive models designed to address macro level cargo movement and, therefore, do not reflect the sensitivities of a synthetic battlefield. As such, there is a need to examine the interfaces between these disparate approaches to modeling to ensure that a more realistic picture of the logistics posture can be modeled as part of the synthetic battlefield.

LOGISTICS HIGH PRIORITY NEED 3 (CONT'D)

Interfaces between Live, Virtual, and Constructive Models (Cont'd)

- **Requirements to satisfy need**
  - **Review and assess current M&S standards and protocols**
  - **Identify any unique standards and protocols which may be necessary to interface logistics models with combat models and simulations (e.g., time compression)**
  - **Review M&S data requirements to ensure that realistic data can be captured to provide a picture of the logistics posture on the battlefield**
  - **Provide the capability to extract and infuse data between combat and logistics models**
  - **Actively participate in groups established to develop standards to ensure that logistics M&S needs are addressed in the design of those standards**

LOGISTICS HIGH PRIORITY NEED 3 (CONT'D)

Requirements to Satisfy the Need

The requirements necessary to satisfy this need have broader application than just the interfaces between logistics and combat models. In reality, this need is a subset of a broader requirement to define a core set of standards and interfaces that are suitable across DOD M&S applications. The following requirements are key to satisfying this need:

- Review and assess current M&S standards and protocols
- Identify any unique standards and protocols which may be necessary to interface logistics models with combat models and simulations (e.g., time compression)
- Review M&S data requirements to ensure that realistic data can be captured to provide a picture of the logistics posture on the battlefield
- Provide the capability to extract and infuse data between combat and logistics models
- Actively participate in groups established to develop standards to ensure that logistics M&S needs are addressed in the design of those standards

LOGISTICS HIGH PRIORITY NEED 4

Tools to Support Logistics Considerations in the PPBS Process

- **Background/Explanation**
  - **Linking funding reductions to operational readiness is critical**
  - **Sufficient funding for secondary items is important for better demand forecasting**
  - **Munition requirements coordination is essential to budget allocation and execution**
- **Requirements to satisfy need**
  - **Better models to reflect impact of budget decisions**
  - **Models are needed to address different types of weapons systems, personnel issues, and secondary items**

LOGISTICS HIGH PRIORITY NEED 4

Tools to support the logistics considerations in the PPBS process

There is a need within the P&L M&S community to develop the requisite tools to support logistics considerations in the Planning, Programming, Budgeting System (PPBS) process.

Background/Explanation of Need

Linking reductions in funding for logistics budget line items to the impact on operational readiness for weapon systems is critical to showing the impact on force readiness. Especially important is ensuring sufficient funding for secondary items based on better demand forecasting techniques. Finally, coordination of munition requirements by the Services and Allies is essential to budget allocation and execution.

Requirements to Satisfy the Need

Better analytic models are needed to accurately reflect the impact of budget decisions as related to funding for logistics line items. These models are needed to address different types of weapon systems, personnel issues, and secondary items.

LOGISTICS ROUTINE NEED 1

The Capability to Quantify Implications of Alternative Materiel Management Policies

- **Background/Explanation**
  - **No current capability to assess impact of inventory management decisions/policies**
  - **Algorithm, criteria and policy decisions need to be evaluated**
  - **Math modeling underway between Services and DLA**
- **Requirements to satisfy need**
  - **Simulation model needed to evaluate inventory management model key design and development decisions**

LOGISTICS ROUTINE NEED 1

The capability to quantify the implications of alternative materiel management policies

There is a need within the P&L M&S community to develop the capability to quantify the implications of alternative materiel management policies.

Background/Explanation of Need

The DOD does not currently have the capability to assess the impact of inventory management decisions/policies on the performance of the system to the customer. As the new DOD inventory management system evolves for both reparables and consumable type items several design decisions concerning computational algorithms, stockage criteria, and stockage policy will need to be evaluated. Currently a "math-modeling" between the Services and DLA is underway. This group is reviewing for adopting those portions of existing models which could be integrated into a "best of breed" version for use by the community.

Requirements to Satisfy the Need

A simulation type model is needed to evaluate a priori key decisions relating to the design and development of the new DOD inventory management model. This model could also be utilized by the mathematics modeling group to trade off competing algorithms in terms of their impact on the material management performance.

LOGISTICS ROUTINE NEED 2

An Analysis Capability to Evaluate NDI/COTS Equipment Performance Prior to Purchase

- **Background/Explanation**
  - **NDI/COTS equipments frequently bypass normal acquisition process evaluation and testing**
  - **Trade-off analysis is needed of NDI and COTS prior to testing and procurement**
- **Requirements to satisfy need**
  - **Identify the key readiness and support parameters used to evaluate those equipments which go through the DOD acquisitions process**
  - **Review the development procedures and technical data requirements for commercially developed products**
  - **Identify a family of readiness and support parameters necessary to evaluate NDI/COTS performance**
  - **Develop an approach to evaluate NDI/COTS equipment which considers variability between commercial and military requirements in terms of performance**
  - **Verify the approach through application of specific test cases**
  - **Implement the approach into the DOD acquisition process**

LOGISTICS ROUTINE NEED 2

An analysis capability to evaluate NDI/COTS equipment performance prior to purchase

There is a need within the acquisition community to evaluate Non-Developmental Items/Commercial-off-the-Shelf (NDI/COTS) equipment performance against mil-spec equipment performance prior to purchase.

Background/Explanation of Need

NDI and COTS equipments frequently do not go through the normal acquisition process. Therefore, mil-spec performance requirements for those equipments may not be evaluated through normal testing procedures or, for that matter, may not even exist. With shrinking defense budgets and a trend toward the use of commercial products to satisfy military requirements, there is a need for a capability to perform trade-off analysis of commercial and NDI equipment performance prior to testing and procurement of these equipments for military use. Specifically, the analysis should be able to address acquisition logistics considerations such as reliability, availability, and maintainability (RAM) and overall logistics support constraints.

Requirements to Satisfy the Need

The following are key requirements to satisfy this need:

- Identify the key readiness and support parameters used to evaluate those equipments which go through the DOD acquisitions process
- Review the development procedures and technical data requirements for commercially developed products
- Identify a family of readiness and support parameters necessary to evaluate NDI/COTS performance
- Develop an approach to evaluate NDI/COTS equipment which considers variability between commercial and military requirements in terms of performance
- Verify the approach through application of specific test cases
- Implement the approach into the DOD acquisition process

PRODUCTION NEED 1

Production/Manufacturing Tools for Integrated Product and Process Development

- **Background/Explanation**
  - **FWG late in taking advantage of M&S opportunities**
  - **Objectives need to be developed to communicate with synthetic battlefield**
    - **Baseline existing models/simulations**
    - **Develop new tools to support the IPPD process and factory environment**
    - **Develop necessary interfaces**

PRODUCTION NEED 1

Production/Manufacturing Tools for Integrated Product and Process Development

There is a need to develop a variety of production/manufacturing tools and models that will support Integrated Product and Process Development (IPPD) and that will interface with the synthetic battlefield through an electronic media.

Background/Explanation of Need

The P&L, M&S functional working group was late in initiating work to take advantage of the opportunities offered by models and simulations. Three main objectives are required to be fulfilled in order to communicate, qualitatively and quantitatively, with the synthetic battlefield through an electronic media. First is to baseline existing models/simulations and to ascertain their parameters (i.e., ability to communicate with each other and their utility). Second, develop new tools to support the IPPD process and the factory environment. Lastly, develop the necessary interfaces so that information from the synthetic battle can be used in the design and manufacturing environments for trade studies.

If these needs are not met, transition from R&D will be accomplished without the advantage that is offered by synthetic battlefield simulations. Trade studies will continue to be ad hoc, and cost, schedule, and performance parameters will not be optimized by an analytical military need methodology, but through best estimates that have resulted in cost overruns, poor performance and extended schedules.

PRODUCTION NEED 1 (CONT'D)

Production/Manufacturing Tools for Integrated Product and Process Development (Cont'd)

- **Requirements to satisfy need**
  - **Capability to interface IPPD process model with the synthetic battlefield for improved design definitions**
  - **A requirement to establish a baseline for existing models/simulations for manufacturing and logistics to determine existing utility**
  - **Requirement to model manufacturing process and material parameter tolerances on system performance to aid in establishing designs that are robust with respect to production variability**
  - **Requirement to model factory floor operations for improved efficiencies**
  - **Through modeling techniques, convert product designs into factory floor operations and machine instructions**
  - **Requirement to interface manufacturing and logistics models with simulations (transportation, distribution, and supply) for improved problem solving**

PRODUCTION NEED 1 (CONT'D)

Requirements to Satisfy the Need

Specific requirements to satisfy the needs are:

- Capability to interface IPPD process model with the synthetic battlefield for improved design definitions
- A requirement to establish a baseline for existing models/simulations for manufacturing and logistics to determine existing utility
- Requirement to model manufacturing process and material parameter tolerances on system performance to aid in establishing designs that are robust with respect to production variability
- Requirement to model factory floor operations for improved efficiencies
- Through modeling techniques, convert product designs into factory floor operations and machine instructions
- Requirement to interface manufacturing and logistics models with simulations (transportation, distribution, and supply) for improved problem solving

PRODUCTION NEED 2

Technical Processes and Data Models: Production Control and Shop Floor Control Models

- **Background/Explanation**
  - **Many scheduling techniques are neither real-time nor accurate**
  - **IDEF0 and IDEF1 approaches are not sufficient for future needs**
- **Requirements to satisfy need**
  - **A flexible, real-time production schedule and shop floor modeling capability**
  - **New enterprise methodologies**
  - **Virtual reality techniques in manufacturing process design**
  - **Valid and integrated models for CAD, CAM, CALS, and CAE**

PRODUCTION NEED 2

Technical Processes and Data Models: Production Control and Shop Floor Control Models

A need exists for flexible production control schedule and shop floor control systems.

Background/Explanation of Need

With respect to a flexible, real-time production schedule and shop floor modeling capability, currently there are many scheduling techniques but they are not real-time, nor are they accurate. Bottlenecks in production still result. With respect to new enterprise methodologies, current approaches consist of IDEF0 and IDEF1, but these are not sufficient for anticipated future needs. With respect to virtual reality techniques in manufacturing process design, this emerging technology is being used in commercial enterprise, e.g., architecture and interior decorating, but is not used currently in the design of manufacturing facilities or processes. Current efforts that apply to the requirement to validate and integrate models are the PDES development effort and the Navy Rapid Acquisition of Manufactured Parts (RAMP). The expectation for this element is the development of a joint set of achievable requirements for manufacturing model development and a set of integrated models and tools for technology developers. It is feasible to meet expectation within five years for certain of the above requirements and in excess of five years for others. The impact of not meeting this requirement is unnecessary iteration of manufacturing process configurations, continued manufacturing inefficiency, disruption, stoppage, inefficient allocation and use of resources, and increase in unit cost.

Requirements to Satisfy the Need

For flexible production control schedule and shop floor control systems, there is a requirement to develop a flexible, real-time production schedule and shop floor modeling capability.

New enterprise methodologies that include flexible, computer integrated manufacturing, models of specific manufacturing processes, and models of factory operations are required.

To meet the virtual reality need, there is a requirement to develop and use virtual reality techniques in manufacturing process design.

There is a requirement to validate and integrate models for CAD, CAM, CALS, and CAE by means of an advanced technology demonstration for Thrust 7 (IPPD demonstration).

PRODUCTION NEED 3

Models and Simulation Support of DOD Remanufacturing and Repair

- **Background/Explanation**
  - **No widely accepted capability to reverse engineer parts or systems**
  - **Technical data either unavailable or insufficient**
  - **Technical and policy implementation needed for development of engineering models and requirements**
- **Requirements to satisfy need**
  - **Models and simulations to support reverse engineering**

PRODUCTION NEED 3

Models and Simulation Support of DOD Remanufacturing and Repair

There is a need for models and simulations to support the reverse engineering of parts for remanufacturing.

Background/Explanation of Need

Currently, some automated methods exist for the reverse engineering of electronic parts, but there is no widely-accepted, automated capability to reverse-engineer mechanical parts or systems. Technical data frequently is either unavailable or insufficient. There is an expectation that a set of reverse engineering model requirements and the models themselves can be developed within five years. Both technical and policy implementation will be required to make achievement of this requirement effective. The impact of not meeting this requirement will be the unavailability of replacement parts and the consequent decrement in DOD system readiness.

Requirements to Satisfy the Need

There is a requirement to develop models and simulations that will support the reverse engineering of parts for manufacturing.

PRODUCTION NEED 4

Coordination with National and International M&S Standardization Efforts

- **Background/Explanation**
  - **Emerging ISO and CALS efforts**
  - **Many current models developed without standards**
- **Requirements to satisfy need**
  - **Need to develop and use models that conform to standards**
  - **Need to participate in national and international standardization efforts**
  - **Further maturation required of models and transfer mechanisms**

PRODUCTION NEED 4

Coordination with National and International M&S Standardization Efforts

There is a need to develop and use models that conform to the standards established by national and international standardization efforts.

Background/Explanation of Need

The capability for the integrated use of models and data on both a national and international scale is emerging with the ISO and CALS efforts. However, many existing models have been developed without standards, with the consequence that their integration with other models and data is limited. It is expected that meeting this requirement will result in the integration of production and logistics models on both a national and international scale, the international standardization of both interfaces between functional areas and interface requirements for models and simulations, and the identification of a nationally and internationally accepted set of functional requirements for production and logistics models and simulations. Current progress suggests that this requirement can be met within the next five years. The impact of not meeting this requirement will be a duplication of model development efforts and the inability to communicate among models, with the attendant loss in efficiency.

Requirements to Satisfy the Need

To meet this need, there is a requirement to develop and use models that conform to the standards established by national and international standardization efforts. This requires participation in national and international standardization efforts. It also requires further maturation of CALS-type data models and mechanisms for the transfers of models and data to and from the commercial sector.

PRODUCTION NEED 5

Policy and Management
Direction on Standardization of M&S

- **Background/Explanation**
  - **Existing models are unable to inter-communicate**
  - **P&L needs requirements focus**
- **Requirements to satisfy need**
  - **Standards and conformance enforcement**
  - **Return on investment definition for P&L model development**

PRODUCTION NEED 5

Policy and Management Direction on Standardization of M&S

There is a need to sensitize the P&L community to the Modeling and Simulation program, enforce conformance to standards and to define return on investment for P&L model development and science and technology funding priorities.

Background/Explanation of Need

A number of manufacturing, management, cost and other models exist, but are unable to communicate with each other. In order to take full advantage of the model and simulation efforts it is necessary that all models/simulations be able to communicate with each other through an electronic media. Policy and standards are needed to ensure that new models and simulations are able to interface with each other, thus enabling connectivity between the synthetic battlefield and the virtual factory. In addition, P&L needs to obtain a focus for its requirements into the M&S (DMSO) decision process. Since P&L was late in forming a modeling and simulation functional working group, the community is not completely aware of the advantages and opportunities that M&S can provide. By informing the P&L community of these advantages/opportunities, projects can be better defined that will provide the synergism necessary for IPPD and connectivity with battlefield simulations (i.e., definition for multi-service programs and a focus on hard requirements). Finally, a prioritizing of P&L manufacturing needs should be developed; and as part of this process a need exists to define the return on investment for P&L model development.

Presently, a draft policy document for M&S is in coordination; other needs are not being addressed. It is felt that these needs could be prioritized and completed in the near term (i.e., within the next five years). If these needs are not met, the impact will be a continued fragmentation and duplicity in development of models for the P&L community, no vehicle for supporting P&L requirements/needs in the S&T thrust areas, and a continuation of not getting a P&L focus into the M&S decision making process.

Requirements to Satisfy the Need

- Information to the P&L community in regard to opportunities and advantages that Modeling and Simulation can provide
- Standards and capability to enforce conformance to the standards
- Definition of the return on investment for P&L model development in S&T funding priorities

PRODUCTION NEED 6

Industrial Base Reconstitution

- **Background/Explanation**
  - **Defense Industrial Base is being down-sized**
  - **Commercial sector has replacement capability for some but not all defense requirements**
- **Requirements to satisfy need**
  - **Methodology to identify unique defense requirements**
  - **Models for industrial preparedness planning**

PRODUCTION NEED 6

Industrial Base Reconstitution

There is a need for a capability to identify materials, labor skills, equipments or technologies that may be required for reconstitution and an ability to model the planning associated with reconstitution needs.

Background/Explanation of Need

With the down-sizing of the Defense Industrial Base a requirement exists to identify specific technologies, equipments, manufacturing skills and other assets that are unique to the National Defense. While it is recognized that the commercial sector can replace some segments of the defense manufacturing base, through dual use technologies and manufacturing capabilities, it is also acknowledged that some defense requirements have no counterpart in that sector. Some dated data is available in industrial preparedness and planning documentation, but it is felt that much of the data is not suited for reconstitution modeling or simulation.

It is recognized that modeling and simulation for reconstitution is a long term objective. However, it is felt that unless a methodology is developed for the identification of our needs and requirements for defense specific applications and converted in an appropriate model, we may lose some critical manufacturing capabilities.

Requirements to Satisfy the Need

A methodology needs to be developed to identify those segments of the industrial base that are unique to the National Defense. Those unique segments require identification and reconstitution data for these segments need to be developed for an appropriate model/simulation for industrial preparedness planning.

APPENDIX A

WORKSHOP ANNOUNCEMENT

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, DC 20301-8000

PRODUCTION AND LOGISTICS

04 NOV 1992

(PR)

MEMORANDUM FOR PARTICIPANTS

SUBJECT: Production and Logistics Modeling and Simulation Requirements Workshop

You have been nominated by your organization to attend the Production and Logistics Modeling and Simulation Requirements Workshop to be held at the MITRE Corporation facilities in McLean, Virginia, on November 16-18, 1992. The primary objective of the workshop is to identify the most critical and common modeling and simulation needs of the production and logistics community. The workshop will be professionally facilitated and will employ formal group decision techniques which require active participation by every workshop attendee.

The enclosed attachments provide information that will assist in preparing for and making this a successful workshop. If you have any questions or need additional assistance, please contact either Mr. Roger Koren, DSN 289-8994, Comm (703) 756-8994 or Mr. Mike Zsak, DSN 289-8420, Comm (703) 756-8420. Let me thank you in advance for your participation in this very important and timely effort. I look forward to seeing the results of the workshop.

Nicholas M. Torelli, Jr.
Deputy Assistant Secretary
Production Resources

Attachment(s)

Attachment 1

Production and Logistics Modeling and Simulation Requirements Workshop Overview

The Chairman, Production and Logistics, and the Defense Modeling and Simulation Office (DMSO) invite you to participate in the DoD Production and Logistics Modeling and Simulation Requirements Workshop.

The DMSO is sponsoring workshops to identify modeling and simulation requirements throughout the community. The five DMSO Functional Work Groups (Education, Training and Military Operations; Research and Development; Production and Logistics; Analysis; and Test and Evaluation) are coordinating the planning and execution of the workshops. The objective of the Production and Logistics Modeling and Simulation Requirements Workshop is to identify modeling and simulation requirements for the Production and Logistics (P&L) community. The output from this workshop will be used by the Production and Logistics Functional Working Group to guide the DMSO in promoting the effective and efficient use of modeling and simulation in the Department of Defense.

Participants will be asked to identify their modeling and simulation requirements. Requirements will address short term (0 – 5 years) and/or long term 5 years and beyond) needs.

Workshop organizers will provide an initial set of background briefings that will give an overview of current DoD initiatives related to the P&L community. A vision of the future will also be presented to serve as a common reference. Participants will meet in work groups to discuss P&L community concerns and to develop requirements. Individuals should be prepared to discuss requirements in the areas of policy, management, and technical arenas. Individuals will be assigned to work groups that are most appropriate to their interests and background.

The workshops will be held 16 – 18 November 1992 between 0730 and 1700 at the facilities of the MITRE Corporation in McLean, Virginia. The workshop location is the MITRE Hayes Building, 7525 Colshire Drive, McLean, Virginia 22102 (See map and directions in Attachment 5). Directions and a map showing the location of MITRE is enclosed, as is a list of area hotels. MITRE is approximately 12 miles from either Dulles International or Washington National Airport.

ATTACHMENT 2

WORKSHOP TENTATIVE AGENDA

Day 1, Monday, 16 November 1992

0730 – 0800	Registration	South Entrance MITRE Hayes Building
0800 – 1000	Plenary Session	Auditorium A&B MITRE Hayes Building
	Welcome and Workshop Objectives 15 Minutes	Mr. Michael Zsak
	DMSI 60 Minutes	Col Ed Fitzsimmons
	Workshop Organization 30 Minutes	Mr. Howard Carpenter
0945 – 1000	Break	
1000 – 1200	Service P&L Needs	Auditorium A&B MITRE Hayes Building
1000 – 1100	Navy P&L Needs	Navy presenter
1100 – 1200	Army P&L Needs	Army presenter
1200 – 1300	Lunch	
1300 – 1400	Air Force P&L Needs	Air Force presenter
1400 – 1500	Marine Corps P&L Needs	Marine Corps presenter
1500 – 1515	Break	
1515 – 1615	DMA P&L Needs	DMA presenter
1615 – 1715	DLA P&L Needs	DLA presenter
1715 – 1730	Discussion	

Attachment 4

Administrative Information

Area Hotels

Government Per Diem $110

Embassy Suites 8517 Leesburg Pike (703) 883-0707 Single: $91	3 miles from MITRE
Tysons Westpark Hotel 8401 Westpark Drive (703) 356-9222 Single: $79	1.5 miles from MITRE
McLean Hilton 7920 Jones Branch Drive (703) 847-5000 Single: $90	3 miles from MITRE
Residence Inn 8616 Westwood Center Drive (703) 893-0120 Single: $84	2 miles from MITRE

Messages

While attending the conference you may be reached at (703) 883-5896 and by fax at (703) 883-3343. Messages will be posted at a centralized message board.

APPENDIX B

CHAIRMAN'S REMARKS

ASSISTANT SECRETARY OF DEFENSE
(PRODUCTION & LOGISTICS)

PRODUCTION AND LOGISTICS MODELING AND SIMULATION REQUIREMENTS WORKSHOP

MIKE ZSAK
CHAIRMAN
P&L FUNCTIONAL
WORKING GROUP

ASSISTANT SECRETARY OF DEFENSE
(PRODUCTION & LOGISTICS)

PURPOSE

- DEFINE THE MODELING AND SIMULATION NEEDS OF THE P&L COMMUNITY AND PROVIDE A FORUM TO EXCHANGE INFORMATION

- SENSITIZE THE P&L COMMUNITY TO THE DEFENSE MODELING AND SIMULATION INITIATIVE (DMSI)

- HELP FOCUS THE DMSI

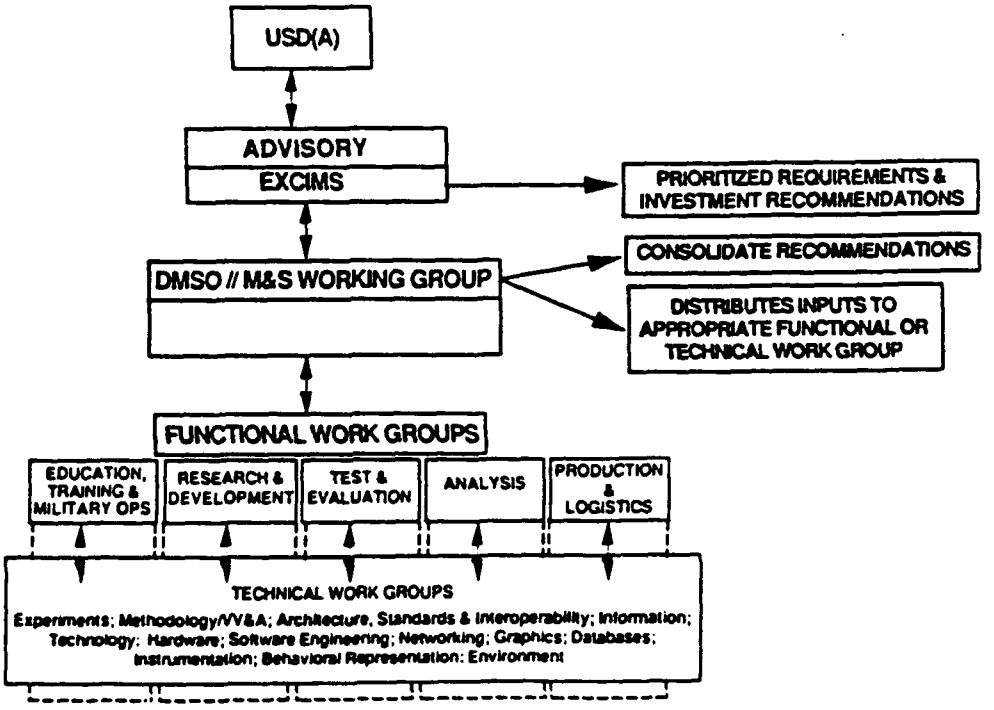
ASSISTANT SECRETARY OF DEFENSE
(PRODUCTION & LOGISTICS)

BACKGROUND

- DMSI IS A FAST MOVING TRAIN
- ORIGINAL FOCUS DID NOT INCLUDE P&L FUNCTIONAL AREA
- WE HAVE HAD THE CART BEFORE THE HORSE
- THERE IS AN OPPORTUNITY TO DO THINGS THE RIGHT WAY AND BECOME A MORE INVOLVED COMMUNITY

ASSISTANT SECRETARY OF DEFENSE
(PRODUCTION & LOGISTICS)

RELATIONSHIPS



ASSISTANT SECRETARY OF DEFENSE
(PRODUCTION & LOGISTICS)

P&L FUNCTIONAL WORKING GROUP RESPONSIBILITIES

- PROVIDE THE M&S FOCAL POINT FOR THE FUNCTIONAL COMMUNITY
- ARTICULATE COMMUNITY-SPECIFIC NEEDS
- COORDINATE WITH TWGs TO INTEGRATE TECHNICAL/TECHNOLOGY WITH FUNCTIONAL NEEDS
- PRIORITIZE AND RECOMMEND PROJECTS

ASSISTANT SECRETARY OF DEFENSE
(PRODUCTION & LOGISTICS)

DEFINITIONS

MODEL. A PHYSICAL, MATHEMATICAL, OR OTHERWISE LOGICAL REPRESENTATION OF A SYSTEM, ENTITY, PHENOMENON, OR PROCESS

SIMULATION. A METHOD FOR IMPLEMENTING A MODEL OVER TIME. ALSO, A TECHNIQUE FOR TESTING, ANALYZING, OR TRAINING IN WHICH REAL-WORLD SYSTEMS ARE USED, OR WHERE REAL-WORLD AND CONCEPTUAL SYSTEMS ARE REPRODUCED BY A MODEL

ASSISTANT SECRETARY OF DEFENSE
(PRODUCTION & LOGISTICS)

WORKSHOP STRUCTURE

- PRESENTATIONS BY SERVICES/AGENCIES
- TWO WORKING GROUPS TO IDENTIFY FUNCTIONAL NEEDS IN THE NEAR TERM (5 YEARS OF LESS) AND THE FAR TERM (5 YEARS AND BEYOND)
  - -- PRODUCTION
    CHAIR: KEN LASALA
    CO-CHAIR: ROGER KOREN
  - -- LOGISTICS
    CHAIR: FRED MYERS
    CO-CHAIR: LTC GARY ARNETT
- OUT BRIEFS BY WORKING GROUPS ON LAST DAY

ASSISTANT SECRETARY OF DEFENSE
(PRODUCTION & LOGISTICS)

WORKSHOP EXPECTATIONS

- IDENTIFICATION OF COMMON, OR JOINT, FUNCTIONAL NEEDS WHICH CAN BE ADDRESSED THROUGH MODELING OR SIMULATION
- A HIGHER AWARENESS OF, AND INVOLVEMENT IN, THE DEFENSE MODELING AND SIMULATION INITIATIVE BY THE P&L COMMUNITY

ASSISTANT SECRETARY OF DEFENSE
(PRODUCTION & LOGISTICS)

WHAT IS NEXT

- WORKSHOP IS FIRST STEP
- P&L FUNCTIONAL WORKING GROUP WILL DEVELOP CONSOLIDATED STATEMENT OF FUNCTIONAL NEEDS BASED ON WORKSHOP OUTPUT
- CONSULT WITH INDUSTRY
- PROVIDE STATEMENT OF NEEDS TO DMSO
- USE STATEMENT OF NEEDS TO INFLUENCE PROJECT CALL AND EVALUATE PROJECT PROPOSALS

APPENDIX C

PARTICIPANTS LIST

PRODUCTION & LOGISTICS WORKSHOP ADDRESS LIST
McLean, VA 16 - 18 Nov 1992

Lt Col Gary Arnett
DLA-LO (Rm 3B330)
Cameron Station
Alexandria VA 22304-6100

Phone (703) 274-6715
Fax (703) 274-3831
E Mail

MR Steve Bernstein
NAVAIR 411
Dept of Navy
Washington DC 20361

Phone (703) 746-0696/0840
Fax (703) 692-8587
E Mail

MR Howard J. Carpenter
MITRE Corp., MS Z-488
7525 Colshire Drive
Syn Env Ap Dpt W-158
McLean VA 22102

Phone (703) 883-5371
Fax (703) 883-3343
E Mail howard@mitre.org

MR Ruey Chen
CD/NSWC
Code 1226
Bethesda MD 20084

Phone (301) 227-1683
Fax (301) 227-3343
E Mail chen@oasys.dt.navy.mil

MS Carole Christiansen
DLA-LC

Phone
Fax
E Mail

MR Bill Clydesdale
SPAWAR 30

Phone
Fax
E Mail

MR Lud Coco
DLA-LO
Cameron Station
Alexandria VA 22304

Phone (703) 274-7227
DSN 284-7227
Fax
E Mail

LT Tim Conley
N402D
Pentagon Room 4C535
Washington DC 20301

Phone (703) 695-3293
Fax
E Mail

PRODUCTION & LOGISTICS WORKSHOP ADDRESS LIST
McLean, VA 16 - 18 Nov 1992

MR Ron Cooke
DASD(PR)/IEQ
Pentagon, Rm 2A318
Washington DC 20301

Phone (703) 697-6329
Fax
E Mail

MR Charles Courchaine
NAVSEA O6KR22
2531 National Center Bldg 3
Washington DC 22036

Phone (703) 602-8176
Fax (703) 602-1697
E Mail

MR Sal Culosi
LMI
6400 Goldsboro Rd
Bethesda MD 20817-5866

Phone (301) 320-7368
Fax (301) 320-5617
E Mail

MR Scott E. Dahne
LMI
6400 Goldsboro Rd
Bethesda MD 20817-5866

Phone (301) 320-7236
DSN 287-2779
Fax (301) 229-2373
E Mail

MR David Danko
DMA

Phone
Fax
E Mail

LCDR Bob Drash
JCS J-4
Pentagon Room 2E827
Washington DC 20318-4000

Phone (703) 697-6110
Fax (703) 697-2024
E Mail

MR Chuck Duncan
MITRE Corp., MS Z-488
7525 Colshire Drive
McLean VA 22102

Phone (703) 883-6281
Fax (703) 883-3343
E Mail cduncan@mitre.org

MS Laura Feinerman
MITRE Corp., MS Z-488
7525 Colshire Drive
McLean VA 22102

Phone (703) 883-7488
Fax (703) 883-3343
E Mail feiner@mitre.org

PRODUCTION & LOGISTICS WORKSHOP ADDRESS LIST
McLean, VA 16 - 18 Nov 1992

MR Glarro Felled
AMC

Phone
Fax
E Mail

MR Gaylen Fischer
AMC (IEA)
USA Industrial Engr. Activity
ATTN: AMXIB-P
Rock Island IL 61249-7260

Phone (309) 782-6712
Fax (309) 782-7170
E Mail gfisch@ria-emh2.army.mil

COL Ed Fitzsimmons
DMSO
1901 Beaurgard St, Suite 504
Alexandria VA 22131

Phone (703) 998-0060
Fax (703) 998-0667
E Mail fitzsim@charm.isi.edu

MR Lance Flitter
CD/NSWC
Code 1253
Bethesda MD 20084-5000

Phone (301) 227-3161
Fax (301) 227-5753
E Mail flitter@oasys.dt.navy.mil

MR Clark Fox
AMSAA (LRAD)
AMXSY-LM
Aberdeen Proving Ground MD 21005-5071

Phone (410) 278-4976
Fax (410) 278-6467
E Mail cjfox@brl.mil

MR Eric Gentsch
LMI
6400 Goldsboro Rd
Bethesda MD 20817

Phone (301) 320-7226
Fax (301) 229-2373
E Mail

MR Jerry Goldblatt
NAVAIR

Phone
Fax
E Mail

MAJ Robert Hadden
HQ DA, ODCSLOG
ATTN: DALO-PLP
Washington DC 20310-0525

Phone (703) 614-1224
Fax (703) 614-2824
E Mail

PRODUCTION & LOGISTICS WORKSHOP ADDRESS LIST
McLean, VA 16 - 18 Nov 1992

COL Thomas Hampton
LPM USMC
HQ MC, 2 Navy Annex
Washington DC 20380

Phone (703) 696-0890/93
Fax (703) 696-2707
E Mail

Lt Col Mike Hathaway
HQ USAF/XORN
DIR, Opns Research
1510 Air Force, Pentagon
Washington DC 20330-1510

Phone (703) 697-3636
Fax
E Mail

MS Roseanne Hynes
DMA Sys Ctr (RPE)
8613 Lee Highway
Fairfax VA 22031

Phone (703) 285-9250
Fax (703) 285-9296
E Mail

MR Bill James
LMI
6400 Goldsboro Rd
Bethesda MD 20817

Phone (301) 320-7328
Fax (301) 320-6940
E Mail

MR Ralph Johnson Jr
CD/NSWC

Bethesda MD 20084-5000

Phone
Fax
E Mail

MR Robert Jordan
HQ DA, OASA (RDA)
ATTN: SARD-DER
Pentagon, Room 2E673
Washington DC 20310-0103

Phone (703) 695-3515
Fax (703) 695-9069
E Mail

LCDR Paula Jordanek
CDR, NAVAIRSYSCOM

Washington DC 20361-5260

Phone (703) 692-3491
Fax (703) 746-2965
E Mail

Lt Col Dan Kolpin
AF LGXX

Washington DC 20330-1030

Phone (703) 697-9305
Fax (703) 693-1020
E Mail ekolpin@sysp4.hq.usaf.mil

PRODUCTION & LOGISTICS WORKSHOP ADDRESS LIST
McLean, VA 16 - 18 Nov 1992

MR Roger Koren
DASD/PR
5203 Leesburg Pike
Suite 1403, Skyline 2
Falls Church VA 22041-3466

Phone (703) 756-8994
Fax (703) 756-7682
E Mail

MR John Kruger
AMC USAYPG
ATTN: STEYP-MT-EW
Yuma AZ 85365

Phone (602) 328-6128
Fax (602) 328-6017
E Mail jkruger@tecnet1.jcte.jcs.mil

MR Ken La Sala
HQ DMA (AQLM)
8613 Lee Highway
Mail Stop A-3
Fairfax VA 22031-2137

Phone (703) 285-9153
Fax (703) 285-9059
E Mail

MR Bill Laird
NRaD

Phone
Fax
E Mail

MR Carl Marchetti
USMC

Phone
Fax
E Mail

MR Bob Mathias
ONYX Corp

Phone
Fax
E Mail

COL W. McDougall
DCSLOG

Phone
Fax
E Mail

MR Scott McLennan
HQ AFMC ENM

Wright Patterson AFB OH 45334-5000

Phone (513) 257-5577
DSN 787-5577
Fax
E Mail

PRODUCTION & LOGISTICS WORKSHOP ADDRESS LIST
McLean, VA 16 - 18 Nov 1992

MR Raymond Melton Jr
NSWC/Carderock Div
Code 1291
Bethesda MD 20084-5000

Phone (301) 227-4383
Fax
E Mail

MR Martin Meth
OASD (P&L)
Director, Weapons Support Improvement Group
Rm 2B322, The Pentagon
Washington DC 20301-8000

Phone (202) 697-1366
Fax
E Mail

MR Joel Milano
CD/NSWC
Code 1253
Bethesda MD 20084-5000

Phone (301) 227-2167
Fax (301) 227-5753
E Mail milano@oasys.dt.navy.mil

MR Fred Myers
OSD/WSIG
5109 Leesburg Pike
Suite 306, Skyline 6
Falls Church VA 22041-3466

Phone (703)756-8420
Fax (703) 756-0415
E Mail fmyers@acq.osd.mil

MR Richard O. Nugent
MITRE Corp., MS Z-488
7525 Colshire Drive
Syn Env Ap Dpt W-158
McLean VA 22102

Phone (703) 883-6320
Fax (703) 883-3343
E Mail nugent@mitre.org

MR Don Pledger
NAVFAC

Phone
Fax
E Mail

MR Dale Rome
CD/NSWC
Code 1255
Bethesda MD 20084-5000

Phone (301) 227-5753
Fax
E Mail rome@oasys.dt.navy.mil

MR Phil Rush
ONYX Corp

Phone
Fax
E Mail

PRODUCTION & LOGISTICS WORKSHOP ADDRESS LIST
McLean, VA 16 - 18 Nov 1992

MR Jim Russell
DLA-LO
Cameron Station
Alexandria VA 22304

Phone (703) 274-7227
Fax (703) 274-3831
E Mail

MR Michael Rybacki
USALEA
ATTN: LOEA-PL
New Cumberland PA 17070-5007

Phone (717) 770-6654
Fax (717) 770-6702
E Mail rybacki@pentagon.-hqdadss.army.mil

LTC Joe Selman
JCS J-4
Pentagon Room 2E-827
Washington DC 20318-4000

Phone (703) 697-6110
Fax (703) 697-2024
E Mail HQDADSSelman

MR Calvin Smith
DLA-LO
Cameron Station
Alexandria VA 22304

Phone (703) 274-7227
Fax (703) 274-3831
E Mail

MR Norm Stewart
MITRE Corp., MS Z-488
7525 Colshire Drive
M&S Center W-156
McLean VA 22102

Phone (703) 883-5371
Fax (703) 883-3343
E Mail stewart@mitre.org

LtCol James Taylor
USMC
3033 Wilson Blvd
Rm 610, CSB
Arlington VA 22003

Phone (703) 696-1080
Fax (703) 696-1083
E Mail

MR Nicholas M. Torelli Jr
DASD (PR)

Phone
Fax
E Mail

CDR Craig Turley
N402D
Pentagon Rm 4C535
Washington DC 20301

Phone (703) 614-2808
Fax (703) 614-7061
E Mail

PRODUCTION & LOGISTICS WORKSHOP ADDRESS LIST
McLean, VA 16 - 18 Nov 1992

MR Tom Welland
I&L Dept. (LPM-3)
3033 Wilson Blvd
Arlington VA 22201-3809

Phone (703) 696-1078
Fax (703) 696-1079
E Mail

MR Edmund J. Westcott
HQ AMCRD
5001 Eisenhower Ave.
Alexandria VA 22333-0001

Phone (703) 274-9850
DSN 284-9850
Fax (703) 617-7810
E Mail

MS Janet Williams
HQ AMC DCG-L
5001 Eisenhower Ave.
Alexandria VA 22333-0001

Phone (703) 274-8657
Fax (703) 274-3718
E Mail williams_janet@aelan@alexandria-emh4.armv.mil

MR James Wohlfahrt
DCSLOG

Phone
Fax
E Mail

MR Michael G. Zsak Jr.
OASD (P&L)
Suite 306, Skyline 6
5109 Leesburg Pike
Falls Church VA 22041-3466

Phone (703) 756-8420
Fax (703) 756-0415
E Mail mzsak@acq.osd.mil

MR Maury Zubkoff
CD/NSWC
Code 1205
Bethesda MD 20084-5000

Phone (301) 227-1099
Fax (301) 227-3106
E Mail

MR Allen Zusman
NAVFAC

Phone
Fax
E Mail

APPENDIX D

AIR FORCE LOGISTICS NEEDS, MODELING AND SIMULATION

LOGISTICS NEEDS

MODELING AND SIMULATION

AF LOGISTICS NEEDS

OVERVIEW

INTEGRATED LOGISTICS

PPBS SUPPORT

POLICY DECISION MAKING

REALISTIC REPRESENTATION IN WARFARE

LOGISTICS NEEDS/REQUIREMENTS

INTEGRATED LOGISTICS SUPPORT
- MAINTENANCE PLANNING
- MANPOWER & PERSONNEL
- SUPPLY SUPPORT
- SUPPORT EQUIPMENT
- TECHNICAL DATA
- TRAINING & TRAINING SUPPORT
- COMPUTER RESOURCES SUPPORT
- FACILITIES
- PACKAGING, HANDLING, STORING, TRANSPORTING
- DISIGN INTERFACE/PARAMETERS

LOGISTICS SUPPORT ANALYSIS

LIFE CYCLE COST

DEPOT SUPPORT REQUIREMENTS

AF LOGISTICS NEEDS

IMPROVE METHODS FOR LOGISTICS PLANNING, PROGRAMMING, AND BUDGETING

READINESS AND SUSTAINMENT ASSESSMENTS TO SUPPORT AND DEFEND PROGRAMMING DECISIONS

BUDGET DECISIONS--WHERE TO TAKE CUTS (OR ADDS) THAT WILL YIELD HIGHEST READINESS AND SUSTAINMENT

NON-TRADITIONAL ROLES (COUNTER DRUGS, RELIEF EFFORTS..)

POLICY

CAPIBILITY TO RAPIDLY QUANTIFY ALTERNATIVE POLOCIES (SUCH AS REPAIR LEVELS & RSK) IN TERMS OF $, MANPOWER, READINESS, SUSTAINMENT, RESOURCE INVENTORIES ETC..

AF LOGISTICS NEEDS

IMPROVED METHODS FOR PLANNING, ANALYZING, COSTING, TESTING INTERTHEATER AND INTRATHEATER MOVEMENT CAPABILITIES AND EVALUATING THE TRADEOFFS AMONG AIRLIFT, SEALIFT, AND PREPOSITIONING

CAPABILITY TO SIZE LOGISTICS INFRASTRUTURE TO SUPPORT REORGANIZATIONS AND ALTERNATIVE FORCES IN A DYNAMIC ENVIRONMENT

HOW DO WE MAKE THE BEST USE OF TOTAL ASSET VISIBILITY?

AF LOGISTICS NEEDS

REALISTIC REPRESENTATION OF LOGISTICS IN WARFARE SIMULATIONS (IN THEATER AND BEHIND THEATER)

REALISTIC LOGISTICS PLANNING, CONTINGENCY ASSESMENTS

PROVIDE TRAINING/EDUCATION/WARGAMING OF LOGISTICS INFRASTRUCTURE FOR EVERY LEVEL OF ORGANIZATION

IDENTIFY CRITICAL LOGISTICS SHORTFALLS

CAPABILITY TO SHOW CHANGES AND SENSATIVITIES OF OPERATIONAL PLANNING FACTORS (SORTIE RATES, SORTIE DURATION, DSO....)

CAPABILITY TO SHOW EFFECTS OR PROOF OF CONCEPTS (IMPROVING LOGISTICS SUPPORT IN COMBAT ZONES.....)

CAPABILITY TO SIMULATE THE FLOW AND BOTTLENECKS OF LOGISTICS

MULTIPURPOSE ENVIRONMENTS
CONNECTIVITY
HUMAN-SYSTEMS INTERFACE
ENVIROMENTAL EFFECT
JOINT AND ALLIED ORIENTATION

APPENDIX E

ARMY PRODUCTION M&S REQUIREMENTS

US ARMY
PRODUCTION M&S REQUIREMENTS

MACHINE DESIGN

- Tolerance effects on performance

  Requirements - Models of equipment performance as affected by production tolerances will contribute to designing cost effective tools and machinery through determining optimum tolerance limits

  Background - Models and simulations will permit analysis of limits of tolerances of individual parts and assemblies in production that affect performance of end items, and can help to determine maximum tool and machinery life as a function of end item performance

US ARMY
PRODUCTION M&S REQUIREMENTS

MACHINE DESIGN

- Human factors

  Requirement - Anthropomorphic models will permit the simulation of production plant human operations that will optimize human factors considerations

  Background - Models and simulations will drive factory designs, layouts, and machine designs to optimize human performance by decreasing training and maintenance time and insure maximum quality of life for production work force

US ARMY
PRODUCTION M&S REQUIREMENTS

MACHINE DESIGN

- Life Prediction of manufacturing equipment

  Requirement - Prediction of component fatigue and wear life of machine parts through models will assist in determining overall life cycle costs of production plant operations

  Background - Models and simulations will enable efficient machine design, provide predictions of machine life component parts and identify control mechanisms that affect overall life cycle costs of production operations

US ARMY
PRODUCTION M&S REQUIREMENTS

PRODUCED MATERIAL

- Components, subassemblies, and assemblies

  Requirements - Models of fielded material and equipment down to component level will enable the production base to rapidly adopt Product Improvements and new technologies to fielded equipment.

  Background - Models and simulations will allow for determining costs and capability to reconfigure production facilities to accommodate product improvements for currently fielded equipment and will provide a legacy of design information for future equipment and material

US ARMY
PRODUCTION M&S REQUIREMENTS

FACTORY LAYOUT

- Factory Infrastructure

  Requirements - Models of factory physical plant (electrical power distribution, cooling systems, heating systems, air circulation) and real time factory scheduling will aid in the design and operation of production facilities

  Background - Models and simulation will permit reconfiguration of factory infrastructure to allow for quick change of production items and technology insertion of new manufacturing processes which will enable agile manufacturing and production facilities and streamline business functions

US ARMY
PRODUCTION M&S REQUIREMENTS

FACTORY LAYOUT

- Environmental effects

  Requirements - Models of atmospheric conditions, soil permeability, and drainage patterns will insure that the design of new and modification of old production facilities will be environmentally compliant

  Background - Models and simulations will allow for determining optimum facility designs that minimize environmental affect and reduce total production costs by minimizing environmental costs

US ARMY
PRODUCTION M&S REQUIREMENTS

FACTORY LAYOUT

- Assembly

  Requirement - Models of pick and put operations, collision detection and machine operations will allow for simulation of assembly operations in the virtual factory

  Background - Models and simulations will assist in determining design requirements for robotics, assembly step processes, and provide feedback to design engineers on the production capabilities to assemble designed parts

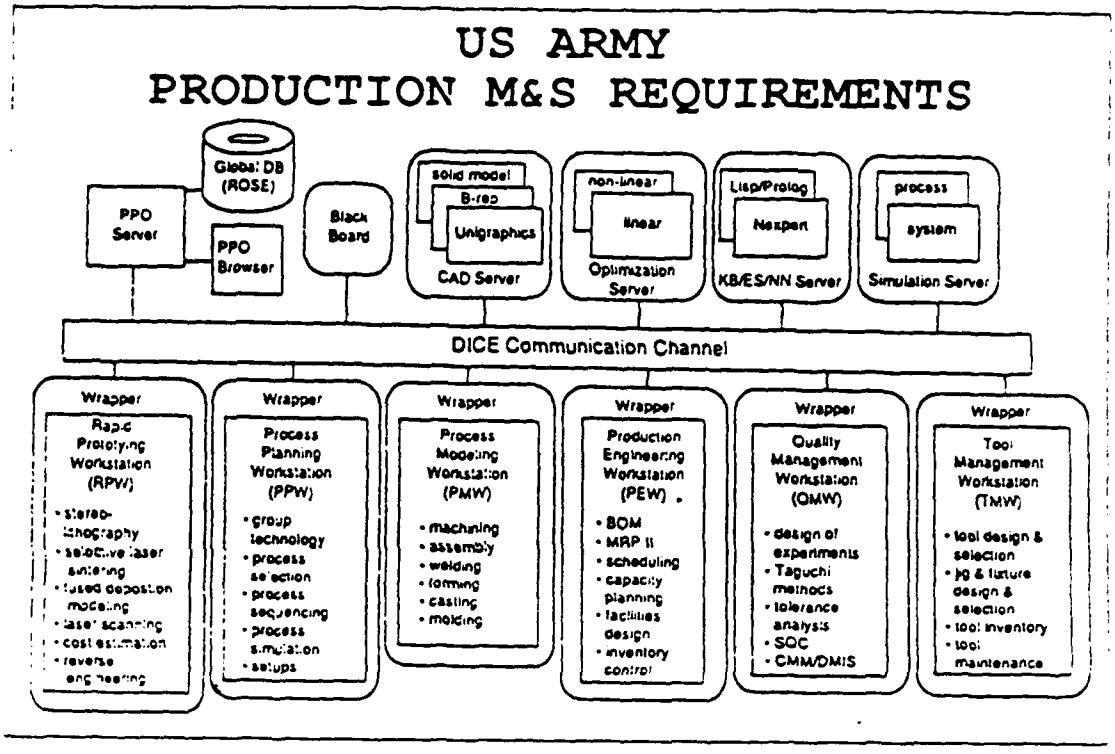
US ARMY
PRODUCTION M&S REQUIREMENTS

MACHINE DESIGN

- Piece part machining

  Requirements - Models of piece part machining, CAD, CAE, CAM, and machining tools will allow for efficient design of manufacturing tools and equipment through simulation

  Background - Models and simulations will assist in designing machines and tools, minimize production waste, minimize numbers of separate operations and will insure development of flexible integrated manufacturing processes



10 November 1992

US ARMY
PRODUCTION M&S REQUIREMENTS

MANUFACTURING PROCESSES

- **Composite material production**

  Requirement - Models of mechanical properties, bonding, and machinability are required to design composite material production facilities

  Background - Models and simulations will enable manufacturing operations to be maximized by assisting in controlling such factors as optimum cure times, rapid pattern making, and determination of raw material quantities required

12 November 1992

US ARMY
PRODUCTION M&S REQUIREMENTS

MANUFACTURING PROCESSES

- Electronic component production

  Requirement - Models of molecular properties, chemical compositions, IC designs, isotropic dispersions, and flexible wire harness assembly are required to determine production plant design and operation with the goal of achieving affordability and quality production with a lot size of 1

  Background - Models and simulations will contribute to maximizing yields, permit flexible process designs, reduce assembly time and minimize raw material usage while increasing quality by defining critical quality control steps and processes

US ARMY
PRODUCTION M&S REQUIREMENTS

FACTORY LAYOUT

- Material Flow

  Requirements - Models of raw and finished material flow on factory floor, shipping and receiving, packaging, storage to allow for designing of flexible virtual factories

  Background - Models and simulations will contribute to designs of virtual factories, maximize the throughput of production, and establish material flow control processes that permit just in time production.

US ARMY
PRODUCTION M&S REQUIREMENTS

- MANUFACTURING PROCESSES
- FACTORY LAYOUT
- MACHINE DESIGN
- PRODUCED MATERIAL

16 NOVEMBER 1992

MR EDMUND J. WESTCOTT
ASSISTANT DEPUTY CHIEF OF STAFF
RESEARCH DEVELOPMENT AND ENGINEERING
US ARMY MATERIAL COMMAND

US ARMY
PRODUCTION M&S REQUIREMENTS

MANUFACTURING PROCESSES

- **Propellant and explosives production**

  Requirement - Models of the chemical compositions, energy releases, physical designs, and mechanical properties are needed to develop simulations needed to design and operate propellant and explosives production facilities

  Background - Models and simulations of propellants and explosives will permit pre-production design of loading plant processes to minimize risk of explosive accidents, increase yield, and improve manufactured quality

APPENDIX F

ARMY LOGISTICS M&S REQUIREMENTS

US ARMY
LOGISTICS M&S REQUIREMENTS

- Combat Interrelationships
- Resource Requirements
- Deployment Simulations
- Intra-Theater Force Movement
- Total Distribution System

US ARMY
LOGISTICS M&S REQUIREMENTS

"COMBAT INTERRELATIONSHIPS"

- STATEMENT OF PROBLEM. Need realistic representations of logistics in air, land, and sea combat simulations to capture the interrelationships of logistics to represent requirements and outcomes.

- BACKGROUND. There is a dynamic relationship between combat and logistics operations that must be represented in our models and simulations if they are to be considered realistic. The capability to accurately represent those relationships for the non-linear battlefield or graduated levels of response requires interactive representations of the logistics functions and the combat operations they support.

US ARMY
LOGISTICS M&S REQUIREMENTS

AMMUNITION DISTRIBUTION MODELING

- STATEMENT OF PROBLEM. Need improvements to ammunition distribution modeling to identify shortfalls in transportation and logistics. Need modeling of inter-theater movement to final destination, inter-theater handling of contingency stocks, configuration of shiploads.

- BACKGROUND. Planning for ammunition distribution has changed to accommodate the needs of a CONUS-based power projection force. Improvements to previous models are needed to provide more real-time transportation aspects.

US ARMY
LOGISTICS M&S REQUIREMENTS

"TOTAL DISTRIBUTION SYSTEM"

- STATEMENT OF PROBLEM. Need a distribution centered simulation that maximizes the on-going total distribution system (TDS) fixes and integrates/aggregates them into a usable series of near real-time decision makers' tools/planners.

- BACKGROUND. The most important series of systems/fixes being developed to enhance the TDS center on knowing what we have, where it is now and how, when, and where it needs to be moved. With the realization of these distribution systems/technologies that fix TDS asset/intransit visibility problem, what is needed now is the methodology that ensures data interconnectivity, accessibility, and usability.

US ARMY
LOGISTICS M&S REQUIREMENTS

SIMULATION OF LOGISTICS FUNCTIONS FOR TRAINING EXERCISES

- STATEMENT OF PROBLEM. Training exercises do not take logistics burdens and limitations into account. Weapon system logistics models are needed that can be plugged into the weapon system training exercises and provide a degree of logistics training to battle commanders.

- BACKGROUND. Battle commanders and troops need some degree of logistics realism through logistics models and simulations that coexist with weapon system simulations.

US ARMY
LOGISTICS M&S REQUIREMENTS

"INTRA-THEATER FORCE MOVEMENT"

- STATEMENT OF PROBLEM. Need improved methods for planning, analyzing, and testing intra-theater force movement requirements and capabilities to determine logistics shortfalls.

- BACKGROUND. A shortfall exists in our ability to determine intra-theater force movement needs. Both movement requirements and capabilities must be represented to satisfy the need for trade-off and risk analysis.

US ARMY
LOGISTICS M&S REQUIREMENTS

MODELING THE IMPACT OF DESIGN DECISIONS UPON MANUFACTURING, LIFE CYCLE AVAILABILITY, AND SUSTAINMENT

- STATEMENT OF PROBLEM. Integrated modeling is needed to evaluate the producibility, supportability, and sustainability impacts of design decisions as they influence weapon system life cycle cost-effectiveness.

- BACKGROUND. Early design decisions during Concept Definition and Validation determine 90% of life cycle costs. It is critical to model the impact of weapon system design during subsequent life cycle phases. Although many models exist for in-depth analysis of important elements of the life cycle, an integrated system is needed to trade-off among the full range of life cycle considerations.

US ARMY
LOGISTICS M&S REQUIREMENTS

"DEPLOYMENT SIMULATION"

- STATEMENT OF PROBLEM. Need the capability to simulate Emergency Deployment Readiness Exercises (sea and air) to supplement live exercises.

- BACKGROUND. The Army Strategic Mobility Plan calls for sea Emergency Deployment Readiness Exercises for each battalion in the military force every 18 months. Air exercises have been cost restrictive. A simulation capability will provide a relatively inexpensive supplement that will support such activities as the Louisiana Maneuvers.

US ARMY
LOGISTICS M&S REQUIREMENTS

CHEMICAL AND BIOLOGICAL DEFENSE (CBD) READINESS AND SUSTAINMENT MODELING

- STATEMENT OF PROBLEM. The need exists to better understand and improve the CBD readiness and sustainment posture. CBD modeling is required to evaluate industrial readiness, existing assets coordination, replenishment planning and execution, spare and repair parts coordination, maintenance and supply downtime.

- BACKGROUND. The Army as the lead service for CBD is responsible for readiness and sustainment planning. As learned from ODS, the CBD commodities are of immense importance. No known efforts exist in developing modeling procedures to test CBD readiness and sustainment.

US ARMY
LOGISTICS M&S REQUIREMENTS

"RESOURCE REQUIREMENTS"

- STATEMENT OF PROBLEM. Need the capability to quantify the implications of alternative materiel management policies and the impact of the wholesale and retail logistics processes in terms of the operational capability and resource requirements of forces, units, and systems.

- BACKGROUND. All resource requirements, to include such aspects as personnel and infrastructure, should be explicitly modeled. Changes in materiel management policies may have different impacts at the force, unit and system level--each of these should be explicitly represented.

APPENDIX G

DEFENSE LOGISTICS AGENCY MODELING AND SIMULATION NEEDS

Defense Logistics Agency

Modeling and Simulation Needs

16 November 1992

Briefer: Gary Arnett, Lt Col USAF

DLA M&S "Needs"

- DoD Inventory Simulation Model
- OPLAN Sourcing Model
- Logistics Business Assessment Model

Defense Logistics Agency
DoD Inventory Simulation Model

- *Statement of the Problem*

DoD needs the capability to simulate the DoD inventory management system, measuring the response to changes in supply management policies, and procedures in terms of resource investment and supply support.

Defense Logistics Agency
DoD Inventory Simulation Model

- *Background*

  - Services are transfering most consumables to DLA for management
  - Previous DLA model was cumbersome in terms of data inputs
  - JLSC developing new DoD system

Defense Logistics Agency
OPLAN Sourcing Model

- *Statement of the problem*

A means is needed to provide a comprehensive set of data inputs to support the evaluation of the feasibility of OPLAN Time-Phased Force Deployment Lists and to assess DLA's ability to source OPLAN Plan requirements.

Defense Logistics Agency
OPLAN Sourcing Model

- *Background*

  - During the 80s three separate and distinct "sourcing" models were developed
  - AMC model - Class I,II,III, and IX (Army only)
    MOBEX model - same as AMC model
    Medical model - only Class VIII (All Services)
  - Models are static vs. dynamic
    - Uses a snapshot of asset levels
    - Reorders not included
    - Direct Vendor Delivery not included

Defense Logistics Agency
DoD Inventory Simulation Model

- *Current status*
  - •• DLA has an initiative planned to develop a general purpose inventory simulation model
  - •• JLSC has ownership of design for future DoD consumable item management system as a near term initiative
  - •• DLA-Services have on-going math modeling effort underway to pick the "best of breed"

Defense Logistics Agency
DoD Inventory Simulation Model

- *Future Efforts*
  - •• TBD

Defense Logistics Agency
OPLAN Sourcing Model

- *Current Status*
  - •• Existing models are inadequate
    - ✓ Time consuming to run
    - ✓ Cannot assess multiple scenarios
    - ✓ No linkage to Industrial Base Planning
    - ✓ Output formats deficient

Defense Logistics Agency
OPLAN Sourcing Model

- *Current Status*
  - •• A joint Service-DLA model is needed to improve pre-crisis planning
    - ✓ Assist CINCs in OPLAQN logistics assessments
    - ✓ Provide meaningful feedback to DLA/Services
    - ✓ To evaluate "what if"/exercise questions

Defense Logistics Agency
OPLAN Sourcing Model

- *Future Efforts*
  - •• A Joint SVC-DLA initiative is a first step to solving the problem for consumable items
  - •• Model is needed prior to next deliberate planning cycle
  - •• DLA's intent is to submit a DMSO project proposal in FY93

Defense Logistics Agency
Logistics Business Assessment Model

- *Statement of the Problem*

  To develop a methodology to examine the impact of force structure changes, Defense Management Report Decisions (DMRDs), Service and DLA policies and practices, future technologies, and other external factors on the future requirements for the types of items and support provided by DLA.

Defense Logistics Agency
Logistics Business Assessment Model

- *Background*
  - •• Planned force structure reductions, base closures, and unit relocations will impact the magnitude, frequency, and geographical distribution of DLA's workload
  - •• Many DMRDs affect logistic support structure and policies
  - •• Normal practice of forecasting future demands from historical data is no longer adequate

Defense Logistics Agency
Logistics Business Assessment Model

- *Current Status*
  - •• Phase I - RAND Corporation completed exploratory 120 day study effort (Aug 92)
  - •• Conceptual model formulated
  - •• Phase II Work Plan

Defense Logistics Agency
Logistics Business Assessment Model

- *Future Efforts*
  - Initiate Phase II -Model Development Awaiting FY93 Funding
  - DLA intends to submit DMSo project proposal for FY93

APPENDIX H

DEFENSE MAPPING AGENCY: TERRAIN REQUIREMENTS AND STANDARDS PROJECT

Defense Modeling and Simulation Office
and the Terrain Requirements and Standards Project

Terrain Requirements and Standards PRoject POC's

Defense Mapping Agency
Systems Center (RPE)
8613 Lee Highway, Fairfax, Va. 22031
POC: Rosanne Hynes, Mail Stop A-14, (703)285-9236

Army
CETEC-CA
Fort Belvoir, VA 22060-5546
POC: Frank Capece (703)355-2804

Air Force
APISA/INTB
Bolling AFB, Wash DC 20332-5000
POC: Maj. Donna Thurnher (202)767-1526

Navy
Naval Research Laboratory Code 300
Stennis Space Center, MS 39529-5004
POC: Mary Clawson (202)653-1610

Defense Intelligence Agency
DIAC/OGA1-B
Bolling AFB, Wash DC 20332
POC: John Breedon (202)373-3476

National Security Agency
T513
9800 Savage Rd.
Fort Meade, MD 20755
POC: Mark Dreyer (301)688-5496

Terrain Requirements and Standards

Participants

- Defense Mapping Agency
- Army Topographic Engineering Center
- Naval Research Laboratory
- Air Force Intelligence
- National Security Agency Information Resources Mgt
- Defense Intelligence Agency

Terrain Requirements and Standards

- Objectives and Scope
  - •survey the M&S community to assess the magnitude, location, accuracy and content of the M&S digital geographic data requirement
  - • develop supporting Military Standards and Product Specifications for high, medium, and low resolution digital geographic data
  - • prototype high, medium, and low resolution digital geographic data sets to support M&S

Terrain Requirements and Standards

- establish standard production methods and procedures for the creation and maintenance of high, medium, and low resolution digital geographic data sets to support M&S applications

- produce digital geographic data sets over the highest priority areas identified in requirements assessment to create a standard M&S spatial database

- define value-added M&S data requirements

Terrain Requirements and Standards

- Objectives and Scope

  - survey the M&S community to assess the magnitude, location, accuracy and content of the M&S digital geographic data requirement

  - develop supporting Military Standards and Product Specifications for high, medium, and low resolution digital geographic data

  - prototype high, medium, and low resolution digital geographic data sets to support M&S applications

Terrain Requirements and Standards

Requirements Questionnaire

- Solicits information required by DMSO concerning uses of M&S, computer architectures, and database requirement

- Solicits information required by DMA in order to meet the M&S digital geographic data requirement
  - current and future exploitation environment
  - data fusion scenarios
  - content, accuracy, topology, media, and packaging needs

Terrain Requirements and Standards

- establish standard procedures for creation, verification, and maintenance of value-added digital geographic data sets

- prototype value-added digital data sets

- establish source collection requirements for M&S digital geographic data sets

DMSO Focused Proposals

Complex Data and Common Tools

- standardization of descriptions, formats, exchange protocols for non-atomic data types
  - composite
  - aggregated
  - derived
  - temporal
- includes
  - database schema
  - repository development
  - verification &validation
  - data integrity and user confidence
- MC&G Issues
  - standard feature/attribution schemes for complex data
  - accuracy, intended use of "cooked" data
- coordination
  - Corporate Information Management (CIM) initiative
  - Joint Database Element Definition (JDBE) project

DMSO Focused Proposals

Architecture for Dynamic Scalability

- development of capabilities to accommodate large, dynamic changes in size and complexity within models and simulation systems
- dimensions of problem include:
  - cardinality- number of objects in the simulation
  - granularity- fidelity and level of detail of objects and environment
  - heterogeneity- diversity of objects and environment
  - variability- temporal changes in cardinality and granularity
- MC&G issues
  - variable resolution datasets
  - value-added data
- Examples of current architectures
  - Distributed Interoperable Simulation (DIS)
  - Aggregate Level Simulation Protocols (ALSP)

DMSO Focused Proposals

Human Performance for Distributed Systems

- Development of capabilities to initialize, control, evaluate and archive exercise data for distributed simulation environments
- includes
  - cognitive workload reduction
  - preparation time reduction
  - performance measurement
  - information overload
  - proficiency: individual, small unit, large unit
- MC&G issues
  - common user interface
  - standard terminology

DMSO Focused Proposals

Environmental Representation

- standardization of synthetic, electronic environment
  - terrain
  - bathymetry
  - meteorology
  - atmosphere
  - near-space
- includes
  - dynamic terrain
  - cross-simulation issues
  - technologies for environmental database generation
- MC&G issues
  - data fusion
  - distributed production environments

DMSO Focused Proposals

Pre/Post-Crisis Action (PPCA)

- Integrate and increase the robustness of existing PPCA models, with goal of developing seamless PPCA simulations
- includes
  - counter-drug initiatives
  - deployment preparation
  - counter-terrorism
  - disaster relief
  - peacekeeping/peace building
  - non-combatant elements
- MC&G issues
  - synthetic environment
  - data integration
  - data fusion

DMSO Focused Proposals

Material Acquisition

- Development of infrastructure and tools for Integrated Product and Process Development (IPPD)
- includes
  - concurrent engineering
  - virtual prototyping
- MC&G issues
  - integration of IPPD and synthetic operational environment

APPENDIX I

USMC LOGISTICS AND ACQUISITION M&S REQUIREMENTS

USMC LOGISTICS AND ACQUISITION

M&S REQUIREMENTS

USMC M&S TOOLS

- WARFIGHTING ORIENTATION
- INTEGRATED
- PLANNING AND EXECUTION

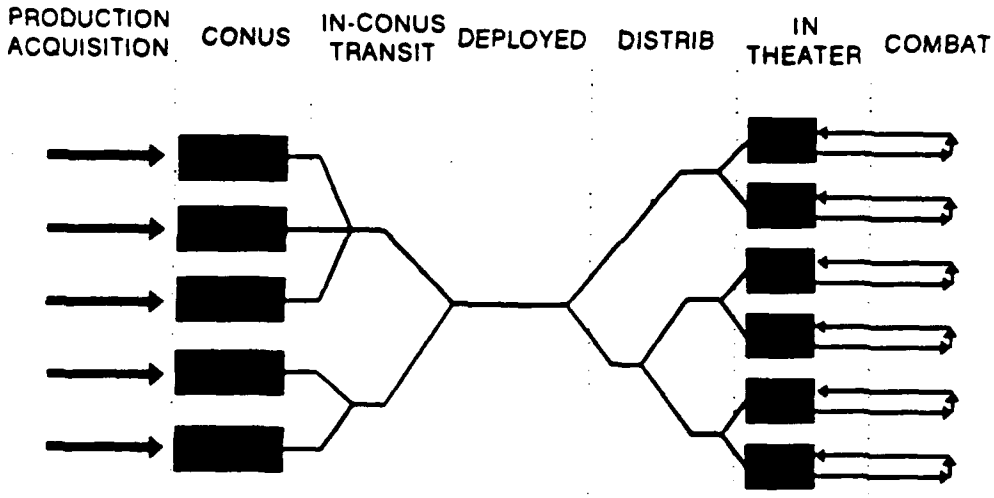
JOINT NATURE

- EXPERIENCE IN SWA
- FUTURE OF U.S. MILITARY
- CROSS-UTILIZATION OF RESOURCES

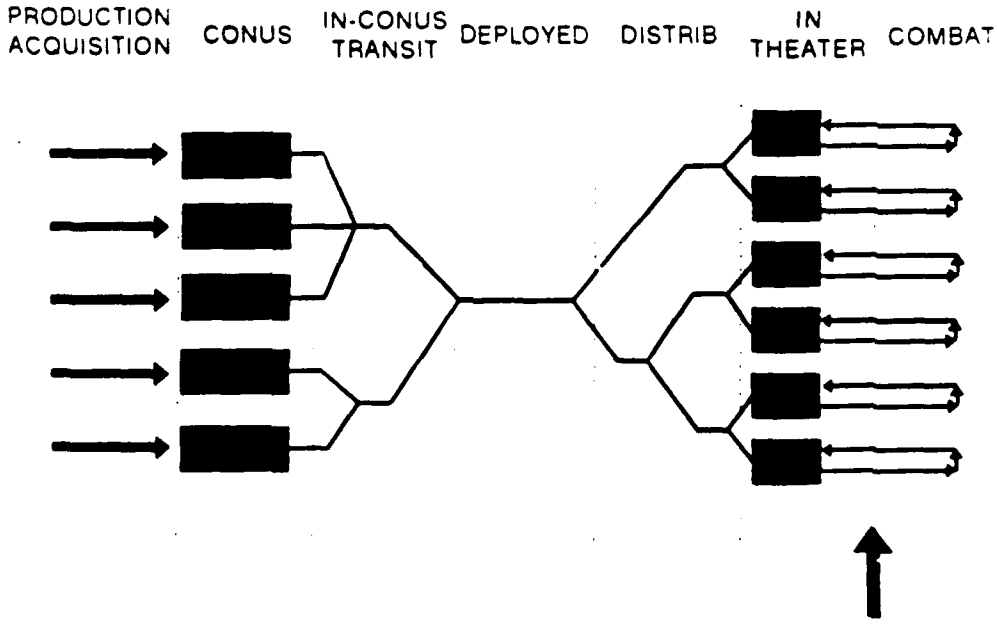
RELATIONSHIPS TO CURRENT BUSINESS

- NO BIG CHANGES
- ENHANCE CURRENT TOOLS
- ENHANCE CURRENT BUSINESS PRACTICES

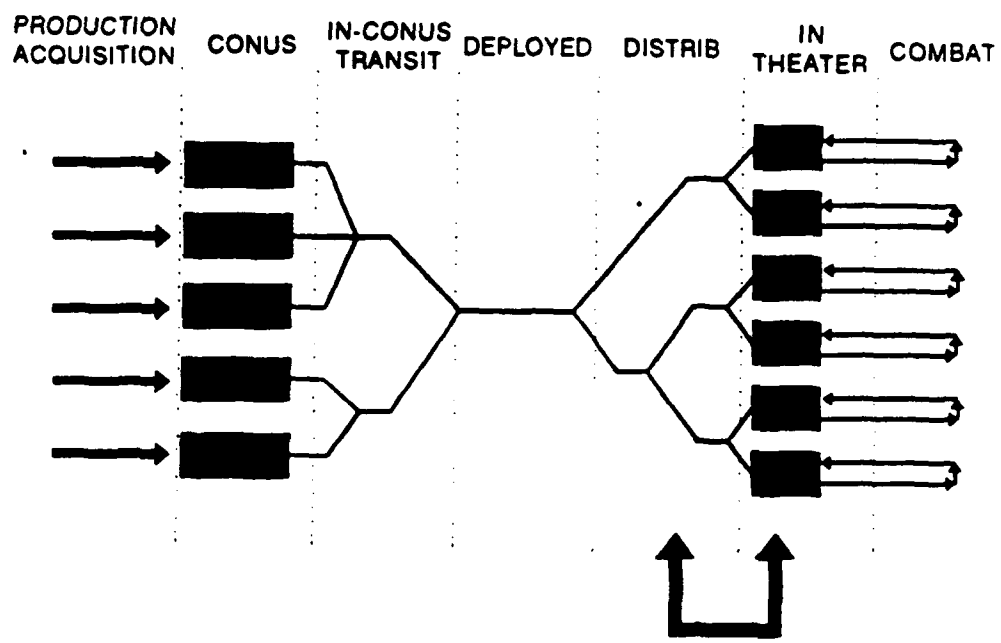
USMC LOGISTICS REQUIREMENTS FOR M&S



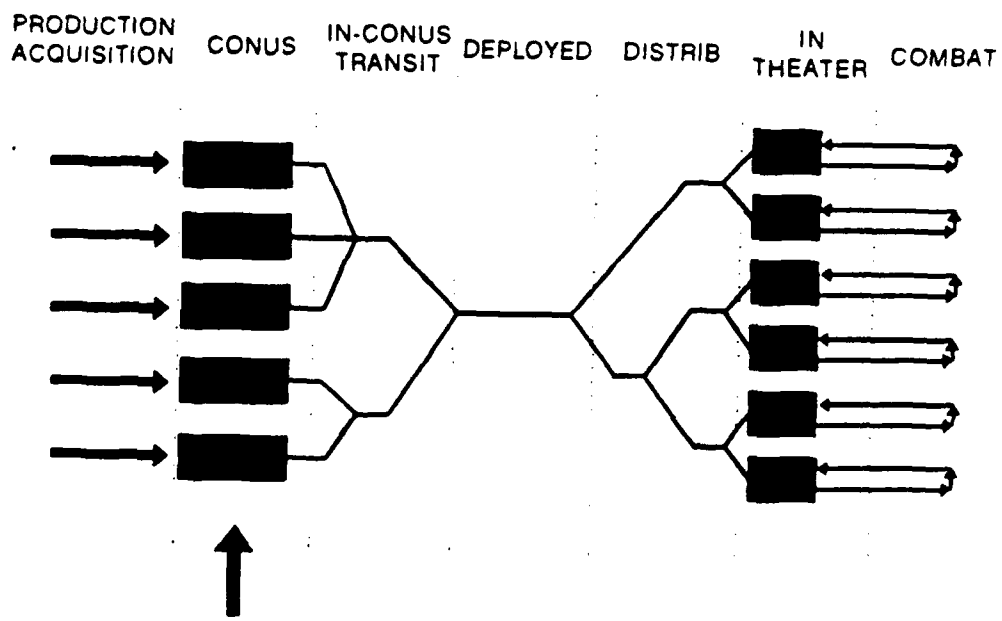
LOGISTICS VS. COMBAT EFFECTIVENESS



IN-THEATER LOGISTICS



FACILITIES SIZING



USMC LOGISTICS M&S REQUIREMENTS BRIEFING

SLIDE 1

1. I'd like to thank the Office of the Secretary of Defense for Production and Logistics and the Defense Modeling and Simulation Office for inviting us here for this workshop.

2. The Marine Corps logistics community is not as involved in modeling and simulation as we would like to be. But we think that the tools that we do have out there are really high quality. Our biggest effort right now, for example, is aimed at meeting not only Marine Corps needs but also Joint and CINC needs, too.

a. The problem we face is lack of resources: both people and money. And with downsizing, we can't expect to have more resources in this area.

SLIDE 2

3. But we feel that our concepts of our current logistics models and simulations are very good--to a large degree, we integrate the modeling and simulation tools into our planning and execution processes. And these logistics tools are aimed at improving our warfighting capabilities. We try to leverage the resources that we have by incorporating these capabilities into our standard planning and execution systems--the ones we use to plan for war and then take with us when wars arise.

a. In fact, a lot of Marines do not even see these as Modeling or Simulation tools, because they are seen as simply pieces of larger systems. This has some distinct advantages:

(1) it trains our Marines to use the same tools for both planning and execution, using modeling and simulation tools to aid in both processes

(2) also, it is consistent with the theory of training the way you fight. The same models and simulations we use in exercises and deployments will be used in contingencies.

4. Of course, some of the Modeling and Simulation tools don't fit into this category, but the highly integrated functions provide a good target to shoot at. We have found that this integration of systems provides us with the most power and capability considering available resources.

SLIDE 3

5. This effort has sparked a lot of interest within our logistics community, because it offers us additional capability. But more than just capability, this can be joint capability.

a. Because of that, we greatly support OSD efforts to bring together the services and provide more joint capability.

b. We recognize, especially in light of Desert Shield/Desert Storm, that future conflicts will probably involve highly coordinated actions of all services. This creates a greater need to coordinate planning and execution. The interoperability of our forces is a great concern; one way to address that is through the interoperability of our logistics planning and execution tools. And especially, as forces become smaller, it requires us to consider ways to pool resources so that all services can benefit from the efforts of the others.

c. So where possible, we want to enter into efforts to enhance joint capabilities in logistics modeling and simulation.

SLIDE 4

6. But the linkage to current tools is critical--building or adopting completely new systems will not necessarily help us. Any tools that we gain from this effort have to aid us in our present way of doing business.

a. In other words, we have to be careful of efforts that might require large staffs or a lot of contractor support.

b. And we stress, where possible, using the same models for both planning and execution. To reiterate, not all models or simulations fit into this category, but it's very important to try to achieve a match whenever possible.

(1) We think it is important for Marines to be familiar with a system before a crisis--with models and simulations built into execution systems, we train for execution as we do our planning

(2) Actually, we have just such a family of systems, called MAGTF II/LOG AIS. But these are still maturing, and work and resources are needed to fully meet the needs of our Fleet Marine Forces.

(3) Of course, this is not intended to take away from some of our other requirements, so let's take a look at them.

SLIDE 5

7. This diagram is a simplified representation of the logistics process--you might even call it a model of sorts. Let me explain it for just a minute.

a. It runs from the production and acquisition phases through all of the logistics requirements in CONUS/other storage. When deliberate or crisis actions are required, we transport equipment within CONUS or their respective storage locations.

Once deployed, we have to subsequently distribute equipment within theater, perform the necessary maintenance, repair, and similar functions in theater, and keep equipment ready to fight.

b. This model is not intended to discount or oversimplify the logistics and acquisition process, it is only intended to increase our understanding of the problems at hand.

c. But the thrust of everything we do is related to the end product....combat effectiveness. As such, we need some very powerful tools to understand the impacts of our logistics and acquisition decisions on our warfighting abilities.

8. So our first requirement is a model to help us understand this entire process and how it relates to combat outcomes. Effects of logistics policies and practices are not always obvious as they relate to combat, especially because missions, enemies, environments, etc. are so different and subject to rapid changes. We especially need to understand these relationships as related to mid- and low-intensity regional conflicts.

a. The tools must be useful in both planning and execution, for slow deliberate and compressed time crisis action situations. It must be capable of use in a joint environment. In other words, it has to be very flexible and responsive in terms of inputs.

b. The tools have to support very diversified functions, from concept validation to maintenance & storage issues to transportation issues to within-theater logistics issues, to final disposition. In other words, we need some set of tools to aid in the conceptualization and control of the entire logistics process. And if you change some aspect of that process, we need to know the direction and magnitude of the effects on our combat capability.

c. So let's go back and take a look at what we're asking for. We're looking for a system of models that are very flexible in their ability to answer a wide range of questions using the same set of assumptions, the same methodologies, and be consistent with the other services. And our Marines have to be using this system on a regular basis so that, when we go to war, those Marines are intimately familiar with the system to do the planning and execution needed for warfighting.

d. This sounds like a pipe-dream, and in terms of present capability, it may be. This is not a simple system development, and it is certainly more than one system. This family of systems, for us, is just developing. In terms of a goal for where we would like to achieve, however, this "pipe dream" is very valid. Again, our MAGTF II/LOG AIS has started on this path, but there are still holes to fill.

e. Within this larger goal, though, we have targeted certain

key areas where we need to build.

SLIDE 6

9. We need to know a lot more about the interface between combat effectiveness and logistics. This is probably the least understood and most important area of logistics. It also has the greatest variability, making it the most elusive to create models that you can trust.

a. We require a model/simulation to plan (with some degree of confidence) for the immediate logistics impacts due to combat action and the ability of the logistics system to support combat. This includes Battle Damage Assessment, Repair, Replacement, Casualty Evacuation, and related Maintenance, Supply, and Transportation functions.

b. Because there are so many functions listed here, this could be viewed as a series or family of models. But there is an important distinction: These models have to all tie together to the degree that they are all using the same assumptions and real-time data throughout the cycles of the individual simulations. For example, if one model is hauling damaged equipment off of the battlefield, another cannot be using the same equipment to fight.

c. This model would also require capability to aid in the planning of purchases of Supply Deployment Blocks and Initial Issue Spares Packages. If we can predict our materiel requirements with some degree of confidence, our purchasing and overall supply system can function more efficiently and better support our combat forces.

SLIDE 7

10. The next area of concern is in-theater logistics operations. We require a model to handle both planning and execution aspects of offload and distribution of materiel within theater. The model must be joint-service interoperable and be capable of planning both administrative and combat offloads. Distributional capability is required across a broad range of environments and enemy actions.

a. But these system(s) have to fit in with our present systems--we don't want to adopt a new way of doing business to fill system holes. In other words, it has to fit into our MAGTF II/LOG AIS family.

c. This system has to handle everything from unloading ships to organizing storage to distributing equipment in-theater.

SLIDE 8

11. The last area of concern is in facilities sizing. Although facilities do not impact quite so directly on combat

effectiveness, this has become a major concern during down-sizing. We need a model to aid in the sizing of facilities to accommodate changing force size and equipment mixes. We have seen several models in the other services which do just that, but the methodologies differ. What we're looking for is a modeling methodology that is accepted across the DoD so that we can use it.

12. So in summary, the Marine Corps Logistics community is not asking for a lot of new M&S systems to fill new needs. What we need is to fill gaps in our present requirements and present systems. And we are looking to come together with our sister services in joint efforts, where possible, to meet a lot of those needs. There are several reasons for this. First, other services may have already solved problems that we are still grappling with. Second, the joint nature of modern warfare demands that we plan in a joint environment so that we can execute actions together. And lastly, the Marine Corps just does not have the personnel and monetary resources to build all of the Modeling and Simulation tools that we see as crucial to our future viability.

a. Again, I'd like to thank OSD and the Defense Modeling and Simulation Office for inviting us today. Also, many thanks to Mitre and LMI for their great support work.

b. Are there any questions?

APPENDIX J

NAVY PRODUCTION AND LOGISTICS M&S REQUIREMENTS

NAVY PRODUCTION AND LOGISTICS MODELING AND SIMULATION REQUIREMENTS

PRESENTED BY:
CDR CRAIG TURLEY
OPNAV (N4)

16 NOVEMBER 1992

DEFENSE MODELING AND SIMULATION WORKSHOP
U. S. NAVY WORKSHOP ATTENDEES

CHIEF OF NAVAL OPERATIONS (LOGISTICS/N4)
NAVAL SYSTEMS COMMANDS
- NAVAIR
- NAVSEA
- SPAWAR

NAVAL FACILITIES COMMAND
NAVAL SURFACE WARFARE CENTER
LOGISITICS MANAGEMENT INSTITUTE (LMI)

FLEET SUPPORT
MODELING AND SIMULATION

- REQUIREMENTS FUNCTIONALLY DRIVEN
- FUNCTIONAL AREAS INCLUDE:

  TRANSPORTATION
  MATERIAL
  MAINTENANCE
  SHORE FACILITIES/INSTALLATIONS
  ACQUISITION
  INFORMATION
  SAFETY/ENVIRONMENTAL
  MANAGEMENT
  PEOPLE

TRANSPORTATION MODELING

- SEALIFT
  - SHUTTLE SHIPS
  - PREPOSITIONED SHIPS
- AIRLIFT
  - COMMON AIRLIFT
  - NAVY SPECIFIC AIRLIFT
- READY RESERVE FORCES
  - MAINTENANCE
  - MANNING
  - MOBILIZATION
- MERCHANT SHIP NAVAL AUGMENTATION

MATERIAL SUPPORT MODELING

- COMMODITIES
  - CONSUMABLES
  - ORDNANCE
    - * INVENTORY MANAGEMENT
    - * STORAGE
    - * REWORK
    - * DEMILITARIZATION
  - FUELS
  - SPARES
- WAR RESERVES
- PREPOSITIONED MATERIALS
- MOBILE CARGO HANDLING

MAINTENANCE MODELING

- SHIP/AIRCRAFT REPAIR
  - ORGANIZATIONAL
  - INTERMEDIATE
  - DEPOT
- INTERMEDIATE MAINTENANCE ACTIVITY (IMA)
  - AFLOAT
    - * TENDER
    - * SALVAGE
  - ASHORE
    - * SHORE INTERMEDIATE MAINTENANCE
    - * AVIATION INTERMEDIATE MAINTENANCE
- IN SERVICE ENGINEERING
- INACTIVATIONS
  - SHIPS
  - AIRCRAFT

ACQUISITION MODELING

- FLEET MODERNIZATION
- INTEGRATED LOGISTICS SUPPORT
- R & D
- CONFIGURATION MANAGEMENT
- INDUSTRIAL BASE
- MANUFACTURING TECHNOLOGY
- CALS

SHORE FACILITY MODELING

- BASE OPERATIONS
- ADVANCED BASE FUNCTIONAL COMPONENTS
- FAMILY HOUSING
- BOQ/BEQ
- PUBLIC WORKS
- REAL PROPERTY MAINTENANCE
- MILCON
- TRAINING COMMANDS

HIGHEST PRIORITY

DEVELOP THE MODELING CAPABILITY TO SIZE LOGISITIC/FLEET SUPPORT INFRASTRUCTURE (SHORE FACILITIES AND INSTALLATIONS) TO SUPPORT ALTERNATIVE FORCES IN A DYNAMIC ENVIRONMENT.

INFRASTRUCTURE MODELING

- BASE OPERATIONS
- ADVANCED BASE FUNCTIONAL COMPONENTS
- FAMILY HOUSING
- BOQ/BEQ
- PUBLIC WORKS
- REAL PROPERTY MAINTENANCE
- MILCON
- TRAINING COMMANDS

THE WAY AHEAD

A SERIES OF INTERRELATED/LINKED CAD COMPUTER DATA BASE MODELS MACRO TO MICRO SCALE LINKING FLEET OPERATING REQUIREMENTS TO SHORE SUPPORT ASSETS

DON PLEDGER O9PC NAVAL FACILITIES ENGINEERING CMD

APPENDIX K

REQUIREMENTS FOR SIMULATION AND MODELING IN MANUFACTURING SYSTEMS

Manufacturing Technology Program

Requirements for Simulation and Modeling in Manufacturing Systems

Eric L. Gentsch
Logistics Management Institute

Chart 1

Manufacturing Systems Committee

- Leo Plonsky - Chairman - Navy
- Bruce Rasmussen - Vice Chairman - AF

- Bill Billiard - OSD/CALS
- Jack Brainin - Navy
- Mickey Hitchcock - AF
- Mike McGrath - DARPA
- John Meyer - NIST
- Phil Nanzetta - NIST
- Don O'Brien - DLA
- Walter Roy - Army
- Brent Starkey - Army
- Julie Tsao - DLA

Chart 2

Background

- Charter: Reduce the cost of weapon systems and other defense materiel through ManTech projects that focus on above-the-factory-floor activities
- ManTech ground rules
  - Technology-based solutions
  - Feasibility demonstrated
  - Industry unable or unwilling to invest
  - Broad impact

Chart 3

Above-the-Shop Floor Manufacturing Support Activities

- Production Management
- Manufacturing Engineering
- Quality Assurance
- Project Management
- Information Management
- Facilities
- Interfaces to
  - Design Engineering
  - Accounting and Finance
  - Personnel Management

Chart 4

Requirements Process

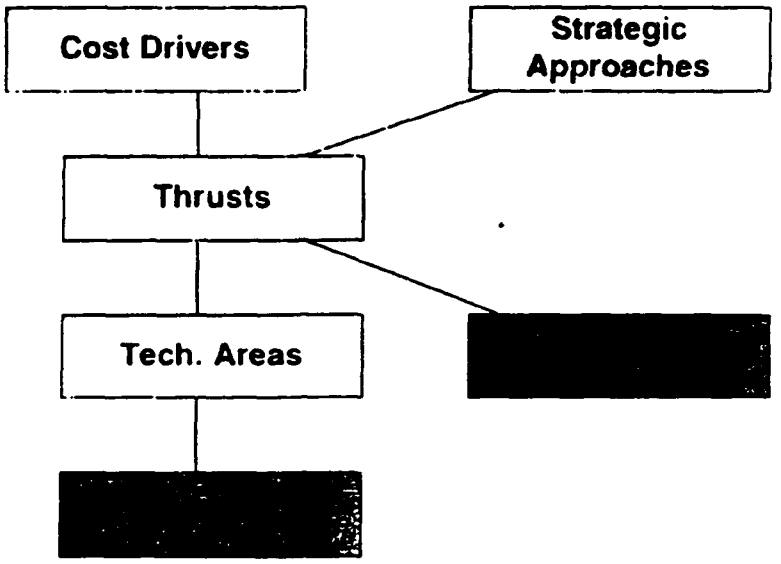
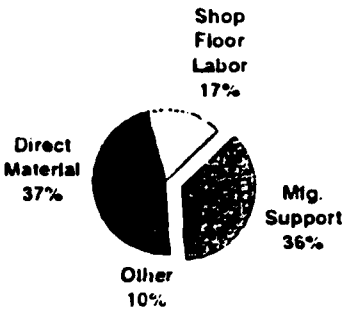


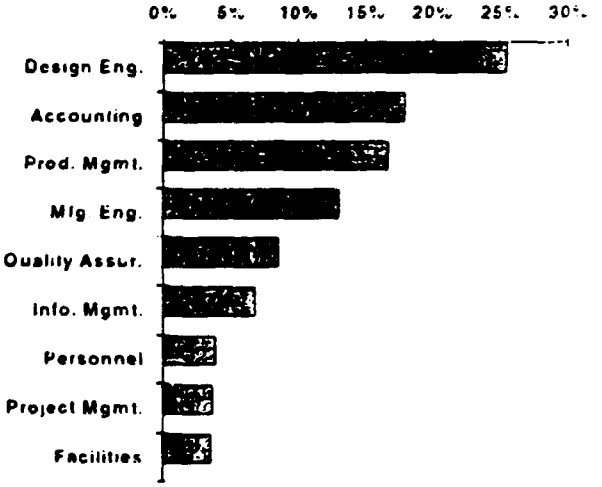
Chart 5

Cost Drivers

Distribution of Corporate Costs



Distribution of Manufacturing Support Costs



Source: 1992 MSC survey of 21 manufacturing firms.

Chart 6

Strategic Approaches

- Reduce "time to market"
- Integrate civil and military production
- Shift historical cost-quantity relationship
- Reduce sub-tier costs
- Reduce manufacturing support costs

Manufacturing Systems Thrusts

- Concurrent Engineering
- Customer-Supplier Relationships
- Enterprise Integration
- Factory C^3
- Quality Management
- Systems on Demand
- System Life Extension and Upgrade

Technical Areas

- Executable Simulation
- Enterprise Modeling
- Model Federation
- Manufacturing/Industrial Engineering Support Tools

Executable Simulation

- Issue: Integrate industry's simulations with development and production operations
  - Access data in near real time
  - Feed back results to business systems
  - Make accessible to line managers
- Broad benefits
  - Increased use of available simulation "engines"
  - More efficient utilization of shop resources as layouts and flows improve; production disruptions and capacity bottlenecks diminish
- Few efforts ongoing

Enterprise Modeling

- Issue: Provide management with tools to improve operations
  - Understand current activities
  - Generate and evaluate alternatives
- Broad benefits
  - More rationale behind corporate restructuring
  - Mix of resources better matched to requirements
- Build on experience
  - Ad hoc approaches
  - IDEF

Model Federation

- Issue: Information systems are dynamic -- but not easily modified
  - Systems analysts need better information models: data in source code, end-use of those data, and implications of changes to those data
  - Need to integrate models, e.g. IDEF0 (activities) and IDEF1 (information)
- Broad benefits
  - Increase systems' response to change
  - Reduce information systems costs
- Few efforts ongoing

Manufacturing/Industrial Engineering Support Tools

- Issue: Engineers must consider more factors when converting product plans to full manufacturing process plans
  - Model system/subsystem/component tradeoffs for *producibility, maintainability, etc.*
  - Simulate effects of alternative processes, equipment, tooling
  - Make production more flexible to volume, mix changes
- Broad benefits
  - Better overall utilization of labor and facilities
  - Less cost sensitivity to demand variability
- Current efforts not sufficient

Chart 13

Summary

- ManTech's Manufacturing Systems Committee focused on above-the-shop floor technical opportunities for cost reduction
- Selected technical areas having broadest potential industry impact
- Positive feedback from industry
  - Society of Manufacturing Engineers
  - Aerospace Industries Association

Chart 14

APPENDIX L

PRODUCTION AND LOGISTICS WHITE PAPER

PRODUCTION AND LOGISTICS

Definition Statement: For the purposes of this paper, Production means the total design and manufacturing process, and Logistics means the total design and field support process.

In the past, the product development process was characterized by stovepipe organizations operating in independent design environments where each functional area executed without consideration of its impact on other functional areas. This resulted in increased cost and schedule delays from design changes required as a system's design progressed through manufacturing and into field operations. To ensure all functional areas are involved concurrently, the current trend is to provide interactive links to all areas (e.g., engineering, logistics, production, financial, contracting) into a multi-disciplinary design team established at program conception. Use of these multi-functional teams is referred to as Integrated Product and Process Development (IPPD). (See Note 1.)

These multi-disciplinary teams are being established at program conception (Milestone 0) and being maintained through disposal (although their character will change through the life cycle). In order to function properly, the IPPD process requires tools and techniques, such as Modeling and Simulation (M&S), that will allow each area to be actively involved in a real-time seamless environment, in every aspect of the product development process.

M&S provides an important set of tools that can allow for trade-offs and optimization to occur in this seamless fashion, between the many functional areas involved in fielding a military system. M&S can also provide the vehicle for the User, defined as the warfighter, maintainer, supplier, transporter, etc., to become involved in every phase of development. Under this new concept, the User becomes a continuous and active member of the multi-disciplinary IPPD team by providing opportunities for requirements generation and validation to be placed in the hands of future users before committing to production. To reach its full potential, in this view, IPPD M&S must be integrated with the Synthetic Battlefield at sufficient levels of detail so that all aspects of system characteristics, that is, performance, manufacturing and logistics, can be evaluated.

For the purpose of this focus paper, the use of interactive (man-in-the-loop) M&S throughout the product development will be referred to as "virtual prototyping". (See Note 2.)

Scope: Government, industry, and academia are working on stand-alone M&S tools for the IPPD process. However, there are many holes in the stand-alone tools, particularly in the logistics (e.g., models for repair of complex equipments). Also, some work is being performed on the framework and distributed data bases required to integrate these tools. However, only limited work is being done to integrate the User as a full member of the multi-disciplinary IPPD team. Many of the various tools available today are not interoperable and do not support the "vision" of a seamless M&S weapon system product development process. The scope of this proposal call is to provide for the additional stand-alone tools, particularly for logistics, and for demonstration and connectivity of this seamless environment in areas that have not been fully integrated to date.

Current State of Capabilities and On-Going Efforts: User-in-the-loop engineering simulation that defines human/system performance trade-offs is limited to very high level system performance analysis. Hardware-in-the-loop physical simulation that accounts for difficult-to-model behavior and failure modes occurs in isolated facilities with isolated tools. Subsystem M&S that relates performance to design characteristics is well developed, but isolated to certain commodity areas. M&S that relates design characteristics to requirements of the production system is limited to inadequate empirical and theoretical data on unit processes. Logistics M&S is limited to very simple parametric factors such as tonnage.

Description of Desired Capabilities: Many topics are included in the area of M&S for Production and Logistics. For FY93, proposals in two general areas described below, are of primary interest. Other proposals that address specific deficiencies identified in this paper will also be considered.

Production and Logistics Virtual Prototyping: Specifically, how can a virtual prototype, at the detailed engineering design phase (that phase normally associated with the use of CAD/CAM tools), be integrated with the Synthetic Battlefield? Virtual prototypes at this phase replicate, as much as possible, all the salient parameters of an equivalent physical prototype. This effort should demonstrate a bridge between detailed engineering design tools and the Synthetic Battlefield. The intent is to provide a demonstration of capabilities beyond the "functional" performance evaluations, which have already been accomplished on the Synthetic Battlefield with crew station mock-ups. This demonstration would require the involvement of people from both the Synthetic Battlefield (User) and the virtual prototyping communities (IPPD) who would work together in a seamless fashion, to evaluate the systems' characteristics as affected by manufacturing and logistics. Proposals in this area need to provide a demonstration as the final product. It is important that a project in this area clearly demonstrates that it is possible to affect the detailed design of a given product by involving the User and the Synthetic Battlefield in the detailed product development process.

Logistics M&S Tools: Logistics Models have been principally constructive models, primarily focused on movement of materiel as measured by tonnage. There is a dearth of virtual modeling capability and constructive models that deal with most aspects of logistics. Of particular interest are virtual modeling which support the product development phases permitting IPPD and Users to evaluate logistic activities: repair both on and off equipment, vulnerability of planned logistics to damage, capability for repair in chemical/biological environment, etc. Other aspects associated with logistics M&S include ability to simulate battle damage and associated repair process, realistic representations of system operation incorporating reliability and maintainability characteristics, M&S of all off-line logistics activities, such as resupply and decontamination. It is important that the proposals are capable of clearly relating detailed logistics-related design characteristics to both the IPPD and the Synthetic Battlefield environment.

For all submissions, if the recommended efforts exceed one year, the proposal should be structured so that definitive products are identified at the end of each year. Also, a final report will be required documenting what was done, how it was accomplished, the results and recommendations for additional experiments, and future courses of action to be provided as part of the future work.

Note 1: IPPD

Other terms for IPPD include concurrent engineering and simultaneous engineering. In all cases, the customer (User) is to be involved in an integrated multi-functional team as the design definition is proceeding in parallel with the manufacturing and support process definitions.

Note 2: Virtual Prototype

A computer-based simulation of a system or subsystem with a degree of functional realism that is comparable to what would be available from a physical prototype designed for an expressed purpose.

Virtual prototyping allows a new weapon system to be built, tested, modified, redesigned and reconfigured in the "virtual" world of M&S and the Synthetic Battlefield. This process has the ultimate flexibility to allow constant interaction among the IPPD team members (designers, developers, maintainers, and warfighters) as they refine requirements in a rapid, low risk, low-cost manner.

APPENDIX M

INTEGRATED LOGISTICS REQUIREMENTS

Logistics Modeling and Simulation Needs

Production and Logistics
Modeling & Simulation
Workshop

18 November 1992

Overview

- Working Group Objectives
- Group Participants
- Workshop approach
- Results
- Observations

Logistics
Working Group Objectives

- Discuss logistics community concerns
  - Acquisition/Operational perspectives
  - Services/Agency environments
  - Databases, tools, and methodologies
  - Communications infrastructure
- Develop prioritized needs based on Service/Agency briefings, DMSO Guidance and P&L White Paper

  Considerations:
  - Focus on common functional M&S needs
    - -- Identify any Service/Agency unique needs
    - -- Near term (0 - 5 years)
    - -- Long term (5 years +)

Logistics
Work Group Participants

Mr. Fred Myers, OSD
Lt Col Gary Arnett, DLA
Mr. Clark Fox, AMSAA
MAJ Bob Hadden, DCSLOG
Maury Zubkoff, CD-NSWC
Mr. Ray Melton, CD-NSWC
Mr. Steve Bernstein, NAVAIR
CDR Craig Turley, N4
LTC Joe Selman, J-4
LT Tim Conley, N4
Mr. Mike Rybacki, LEA
Mr. Charles Courchaine, NAVSEA
LtCol James Taylor, Marine Corps
Col Tom Hampton, HQMC
Mr. Tom Weiland, HQMC
LCDR Bob Drash, J-4
Lt Col Dan Kolpin, AF/LG

Workshop Approach

- Participant backgrounds
  - Areas of expertise
  - M&S experience
  - Potential areas of contributions
  - Expectations
- Integrated team building
  - Maximized cross-fertilization of user perspectives
  - Identified needs based on previous briefings, DMSO guidance, and P&L white paper
  - Consensus building exercises
- Compared needs with P&L strawman
- Prioritize needs into three categories
  - Critical
  - High
  - Routine

Logistics Needs

- Higher fidelity representation of Logistics with combat models
- Creation of credible logistics databases and data collection capabilities
- Satisfy the requirement for a planning/execution tool to support the CINCs in their OPLAN assessments

- Analysis tool to study the effects of force sizing and unit realignment on the logistics infrastructure
- Acquisition modeling

Logistics Needs (CONCLUDED)

- Develop the interface between live/virtual and constructive models
- Tools to support the logistics considerations in the PPBS process

Logistics Needs

- Capability to quantify the implications of alternative materiel management policies
- Analysis capability to evaluate NDI/COTS equipment performance prior to purchase

Prioritization

	Critical	High	Medium	
1	8	3	0	critical rqmts (hi fidelity of Log)
2	9	2	0	critical rqmts (credible log db)
3	0	6	5	routine priority (DoD inventory Sim)
4	3	5	3	high priority (force sizing tool)
5	2	5	4	high priority (acquisition modeling)
6	1	3	7	routine priority (eval equip performance)
7	1	10	0	high priority (reltnship btwn model types)
8	9	1	1	critical rqmts (support CINC OPLAN assmt)
9	2	5	4	high priority (log issues in PPBS)

Observations

- Interface to other on-going logistics efforts (JLSC, J-8)
- Lack of acquisition oriented representatives
- VV&A of models and databases
- Technology effects on near/long term
- Policy, Management and Technical
- Inter- and Intra- Service/Agency Communication
  - Apostles of P&L M&S effort

Challenges

- Go back to your organization & spread the word
- Become ambassadors for P&L involvement in M&S
- Talk up the capabilities of M&S to help us do your job
- Help identify situations where it can be applied

Wrap-Up

- Were we successful ?
- Where do we go from here ?
- Comments from participants
- Challenge

APPENDIX N

INTEGRATED PRODUCTION REQUIREMENTS

PRODUCTION WORKING GROUP REPORT

18 November 1992

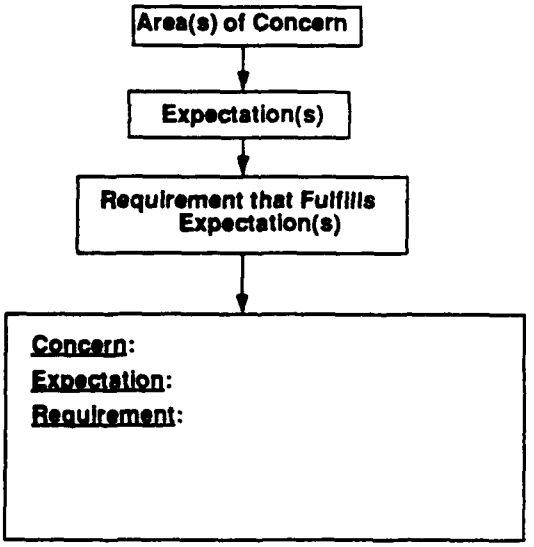
Briefing Outline

- Attendees (Production Panel)
- Agenda
- Areas of concern
- Expectations
- Requirements
- Summary/Conclusions

PARTICIPANTS

Ken LaSala, DMA Chairman
Roger Koren, OSD, Deputy
Ruey Chen, CD/NSWC
Gaylen Fischer, AMC IEA
Lance Flitter, CD/NSWC
Eric Gentsch, LMI
John Kruger, AMC YPG
Scott McLennan, AFMC

Process of Analysis



PRODUCTION NEEDS

- Production Manufacturing Tools for Integrated process and product development (IPPD)
- Technical Process and Data Models
- Coordination with National and International standardization Efforts
- Policy/Management — "Politics"
- M&S in Support of DoD Remanufacturing and Repair
- Models for Industrial Base Reconstitution

PRODUCTION NEEDS (cont'd)

- Production Manufacturing Tools for integrated process and product development (IPPD)
  - Designer communications with manufacturer
    - Include manufacturing and logistics in technology development
    - M&S into design and productions
  - Interconnection among models
  - Integration of acquisition process
  - Data modeling for compute-aided acquisition logistic support (CALS)
  - Recurrent production

PRODUCTION NEEDS (cont'd)

- Technical Process and Data Models
  - Models for flexible computer integrated manufacturing (CIM)
  - Modeling specific manufacturing process
  - Factory operations (recurrent production)
- Coordination with National and International standardization Efforts
  - Participate in international standardization efforts
  - CALS-type data
  - Transfer to and from commercial sector

PRODUCTION NEEDS (cont'd)

- Policy/Management — "Politics"
  - Issue focus and lack of hard requirements
  - Mixed bag of projects
  - Getting P&L focus into M&S (DMSO) decision process
- M&S in Support of DoD Remanufacturing and Repair
- Models for Industrial Base Reconstitution

Expectations

- **Model requirements**
  - **Joint set of achievable requirements for manufacturing model development**
  - **Models/tools for technology developers**
- **Integration issues**
  - **Integrated Logistics-Production**
  - **Define interfaces between functional areas**
  - **Identify functional requirements for P&L**
- **Blueprint for S&T manufacturing and logistics model investment Strategy**

Requirements Overview

PRODUCTION

Production/MFG Tools for IPPD

- Production variability reflects on performance
- Factory floor/ factory operations
- Environmental effects
- Product design conversion
- IPPD-synthetic battlefield interface
- Manufacturing/ Logistics model interface
- Baseline for existing models and simulations

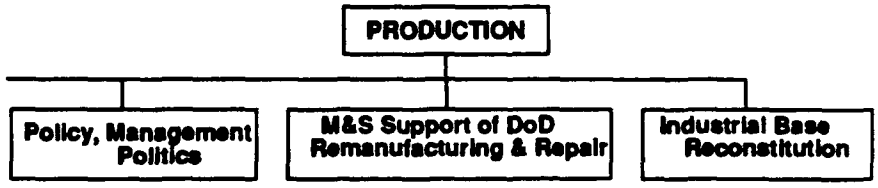
Coordination w/ National & International Efforts

- Models and data conform to IAW standards

Technical Process &Data Models

- Flexible production control schedule & shop floor control systems
- New enterprise methodology
- Virtual reality techniques
- Validate and integrate models

Requirements Overview (cont'd)



- Return on investment for P&L models
- Sensitize P&L to M&S
- Conformance to standards
- Reverse engineer parts
- Identify requirements for reconstitution

Requirement 1— Production Variability Effects on Performance

Topic: Production Manufacturing Tools for integrated process and product development (IPPD)
- Designer communications with manufacturer
  - Include manufacturing and logistics in technology development
  - M&S into design and productions
- Interconnection among models
- Integration of acquisition process
- Data modeling for computer-aided acquisition logistic support (CALS)
- Recurrent production

Expectation: Model requirements
- Joint set of achievable requirements for manufacturing model development
- Models/tools for technology developers

Requirement: Capability to assess manufacturing process and material parameter tolerances on system performance, construct system designs that are robust with respect to production variability (tolerance)

Requirement 1 (Cont)

Orientation: Manufacturing

Category: Technology

Background: Emerging methodology with Taguchi techniques; there are a lot of rules of thumb but no models

Timeframe: Near term (<5 years)

Impact of not meeting requirement: Lower yields, higher unit cost and over-specification

Requirement 2 — Factory Floor/ Factory Operations

Topic Production Manufacturing Tools for integrated process and product development (IPPD)

Expectation: Model requirements

- Joint set of achievable requirements for manufacturing model development
- Models/tools for technology developers

Requirement: Need capability to model the factory floor/factory operations

Orientation: Manufacturing

Category: Technology

Background: CALS and ISO standards apply inside factory

Timeframe: Near term

Impact of not meeting requirement: Lower yields, higher unit cost and over-specification

Requirement 3 — Environmental Effects

Topic: Production Manufacturing Tools for integrated process and product development (IPPD)

Expectation: Model requirements

- Joint set of achievable requirements for manufacturing model development
- Models/tools for technology developers

Requirement: Need capability to model environmental effects to be able to address EPA issues and other environmental impact concerns

Orientation: Manufacturing

Category: Technology

Background:

Timeframe: Near term

Impact of not meeting requirement: Lower yields, higher unit cost and over-specification

Requirement 4 — Convert Product Design into Factory Flow Operations and Machine Instructions

Topic: Production Manufacturing Tools for integrated process and product development (IPPD)

Expectation: Model requirements

- Joint set of achievable requirements for manufacturing model development
- Models/tools for technology developers

Requirement: Need capability to model to convert product design into factory flow operations and machine instructions

Orientation: Manufacturing

Category: Technology

Background: CALS and ISO standards apply inside factory

Timeframe: Near term

Impact of not meeting requirement: Lower yields, higher unit cost and over-specification

Requirement 5 — Interface IPPD Process Model with "Synthetic Battlefield"

Topic: Production Manufacturing Tools for integrated process and product development (IPPD)

Expectation: Integration issues

- Integrated logistics-production
- Define interfaces between functional areas
- Identify functional requirements for P&L

Requirement: Need capability to interface IPPD process model with "synthetic battlefield"

Orientation: Acquisition

Category: Policy & Technical

Background: Capability does not exist currently

Timeframe: Long term

Impact of not meeting requirement: Implementation of thrusts 6&7 cannot be effected

Requirement 6 — Interface Manufacturing and Logistics Models

Topic: Production Manufacturing Tools for integrated process and product development (IPPD)

Expectation: Integration issues

- Integrated logistics-production
- Define interfaces between functional areas
- Identify functional requirements for P&L

Requirement: Interface manufacturing and logistics (transportation/distribution/ supply)

Orientation: Acquisition

Category: Technical

Background: Capability does not exist currently

Timeframe: Near term

Impact of not meeting requirement: Inventory mismatch with actual need

Requirement 7 — Baseline for ExistingModels and Simulations for Manufacturing and Logistics

Topic: Production Manufacturing Tools for integrated process and product development (IPPD)

Expectation: Blueprint for S&T manufacturing and logistics investment Strategy

Requirement: Need to establish baseline for existing models and simulations for manufacturing and logistics

Orientation: Manufacturing

Category: Management

Background: No known baseline or baselining capability exists

Timeframe: Near term

Impact of not meeting requirement: Duplication of effort and models

Requirement 8 — Models and Data Developed According to Standards

Topic: Coordination with National and International standardization Efforts
- Participate in international standardization efforts
- CALS type data
- Transfer to and from commercial sector

Expectation: Integration issues
- Integrated Logistics-Production
- Define interfaces between functional areas
- Identify functional requirements for P&L

Requirement: Use models & data developed in accordance with national & international standards

Orientation: Acquisition

Category: Policy, Technical

Background:Capability emerging in ISO &CALS; many models developed without standards

Timeframe:Near term

Impact of not meeting requirement: Duplication, unable to communicate and integrate

Requirement 9 — Flexible, Real-Time Production Schedule & Shop Floor

Topic: Technical Process and Data Models
- Models for flexible computer integrated manufacturing (CIM))

Expectation: Model requirements
- Joint set of achievable requirements for manufacturing model development
- Models/tools for technology developers

Requirement: Develop a flexible, real time production schedule and shop floor modeling capability

Orientation: Manufacturing

Category: Technical

Background: A lot of scheduling but not real time and inaccurate with bottlenecks

Timeframe: Near term

Impact of not meeting requirement: Manufacturing inefficiency, disruption, stoppage, unit cost increase.

Requirement 10 — New Enterprise Modeling Methodology

Topic: Technical Process and Data Models
- Models for flexible computer integrated manufacturing (CIM)
- Modeling specific manufacturing process
- Factory operations (recurrent production)

Expectation: Model requirements
- Joint set of achievable requirements for manufacturing model development
- Models/tools for technology developers

Requirement: Need to develop new enterprise modeling methodology

Orientation: Acquisition

Category: Management

Background: IDEF0, IDEF1

Timeframe: Near term

Impact of not meeting requirement: Inefficient allocation and use of resources

Requirement 11 — Integration of Models for Manufacturing and Development

Topic: Technical Process and Data Models
- Models for flexible computer integrated manufacturing (CIM)
- Modeling specific manufacturing process
- Factory operations (recurrent production)

Expectation: Model requirements
- Joint set of achievable requirements for manufacturing model development
- Models/tools for technology developers

Requirement: Need to integrate models for manufacturing and development

Orientation: Manufacturing

Category: Technical

Background: Models exist for well established materials & processes; models do not exist for some critical or emerging technologies.

Timeframe: Near term & long term

Impact of not meeting requirement: Poor yield, inadequate performance

Requirement 12 — Virtual Reality Techniques

Topic: Technical Process and Data Models
- Models for flexible computer integrated manufacturing (CIM)
- Modeling specific manufacturing process
- Factory operations (recurrent production)

Expectation: Model requirements
- Joint set of achievable requirements for manufacturing model development
- Models/tools for technology developers

Requirement: Use virtual reality techniques in manufacturing process design

Orientation: Manufacturing

Category: Technical

Background: Emerging technology used in commercial enterprise (e.g., architecture, interior decorating)

Timeframe: Near and long term

Impact of not meeting requirement: Unnecessary iterations of manufacturing process configuration

Requirement 13 — Validate and Integrate Models

Topic: Technical Process and Data Models
- Models for flexible computer integrated manufacturing (CIM)
- Modeling specific manufacturing process
- Factory operations (recurrent production)

Expectation: Integration issues

Requirements: Need capability to validate and integrate models for CAD, CAM, CALS, CAE (Advanced Tech Demo for Thrust 7) [IPPD Demo]

Orientation: Acquisition

Category: Technical

Background: PDES effort, Rapid Acquisition of Manufactured Parts (Navy RAMP)

Timeframe: Near-term

Impact of not meeting requirement: Unnecessarily long development time, extra cost due to complicated integration of system components

Requirement 14 — Define Return on Investment for P&L Model Development

Topic: Policy management "Politics"
- Issue focus and lack of hard requirements
- Mixed bag of projects
- Getting P&L focus into M&S (DMSO) decision process

Expectation: Blueprint for S&T investment strategy

Requirement: Need to define return on investment for P&L model development in S&T funding priorities

Orientation: Acquisition

Category: Policy, management

Background: Not done (well, if at all)

Timeframe: Near term

Impact of not meeting requirement: No vehicle for supporting P&L in S&T

Requirement 15 — Sensitize P&L Community to M&S Program

Topic: Policy management "Politics"
- Issue focus and lack of hard requirements
- Mixed bag of projects
- Getting P&L focus into M&S (DMSO) decision process

Expectation: Blueprint for S&T investment strategy

Requirement: Need to sensitize P&L community to M&S program

Orientation: Acquisition

Category: Management

Background: Not done now

Timeframe: Near term

Impact of not meeting requirement: P&L will lag in M&S

Requirement 16 — Enforce Conformance to Standards

Topic: Policy management "Politics"
- Issue focus and lack of hard requirements
- Mixed bag of projects
- Getting P&L focus into M&S (DMSO) decision process

Expectation: Integration issues

Requirement: Need capability to enforce conformance to standards

Orientation: Acquisition

Category: Management, policy

Background: Draft DoD policy

Timeframe: Near term

Impact of not meeting requirement: Continued fragmentation and duplication

Requirement 17 — Reverse Engineer Parts

Topic: M&S in support of DoD remanufacturing and repair

Expectation: Model requirements

Requirement: Need capability to reverse engineer parts for remanufacturing

Orientation: Manufacturing

Category: Technical, policy

Background: No automated capability for mechanical system; tech data frequently unavailable or insufficient

Timeframe: Near term

Impact of not meeting requirement: Replacement part unavailability

Requirement 18 — Identify Reconstitution Materiels, Skills, Equipment and Technologies

Topic: Models for industrial base reconstitution

Expectation: Model requirements

Requirement: Need capability to identify materiels, labor skills, equipment or technologies that will be required for reconstitution

Orientation: Acquisition

Category: Policy, management, technical

Background: Some dated data available: industrial preparedness, planning

Timeframe: Long term

Impact of not meeting requirement: Lost manufacturing capabilities

P&L OBSERVATIONS

- P&L must play in S&T planning
- Topic areas are interdependent
- M&S allows P&L to influence design process, (via IPPD)
- Model integration is critical, but a difficult challenge

SUMMARY

- 6 Topics identified
- 18 requirements
- P&L can make critical inputs to S&T development when an active player in M&S

Perspectives and Expectations

Orientation	Expectations
Acq: 4.5 MFG: 2.5	• Develop Joint requirements for manufacturing Model dev • Integrated Logistics-Production
Models or Simulations Models: 4.5 Sims: 2.5	*Recommendations* • Get P&L ideas in Services • Blueprint for S&T Investment Strategy • Define interfaces between functional areas • Set of achievable goals (products not "ideas") • Models/tools for technology developers • ID functional requirements for P&L community

APPENDIX O

WORKSHOP OBSERVATIONS

OBSERVATIONS

During and after the presentations made to the Executive Panel in Session 3, comments and observations were made, and it was recommended that these comments not be lost. This paper is an attempt to capture those observations for future use.

General Observations

This workshop and the resulting prioritization of needs gave no explicit consideration to goals and objectives of the DMSO. It was reiterated several times during the workshop preparation, as well as during the workshop itself, that the DMSO does not see itself in the business of funding new models for the P&L community. In fact, the vision of the DMSO is more concerned with (1) readily available, operationally valid simulation environments and (2) technology that supports affordable, reusable components interoperating through an open systems architecture. Goals to guide activities aimed toward achieving the DMSO vision impose the following criteria upon M&S candidates for funding:

- Support DOD components missions (applicability)
- Serve individual DOD component and overall DOD needs (availability)
- Adapt readily to new scenarios (flexibility)
- Reproduce real-world results as accurately as needed (realism)
- Allow use and interaction of the full range of existing and future M&S (openness).

In addition, specific objectives of the DMSI, falling into general and technical categories, deal with management, policy, investment, architectural development, methodological development, and advanced technologies.

Maintaining this perspective, the P&L FWG needs to be very clear about its objectives. Perhaps the greater challenge for the P&L FWG, in its recommendation of qualifying M&S projects, is to identify their consistence with the DMSO goals and objectives in such clear terms as to be easily recognizable by the DMSO. Additionally, a suggestion from the workshop is that the FWG should carefully integrate (or "harmonize") Production and Logistics workshop results. For example, it is important that "solutions" use the same terminology.

Several participants expressed the importance of continued communication in the M&S area, not just within each organization, but between Services and Agencies. An obvious vehicle supporting this objective would be to continue P&L M&S Workshops to foster exchange of information. Periodic workshop participation would not only promote an on-going M&S dialogue, but would encourage further cross-fertilization, identify common needs, increase familiarity with on-going work toward meeting P&L needs, and identify status of such on-going efforts.

Some shortfalls in the present workshop were noted. For example, in any future P&L workshops, more time must be allowed for preparation by its participants. Reparability is an issue not addressed by the present workshop and needs to be included. There is also a need to develop some

frameworks for trade-off analysis. Whether or not the workshops continue, there needs to be an emphasis on better integration between production and logistics elements, as well as between the P&L FWG and the other FWGs that support DMSO.

Interface to Other On-going Logistics Efforts (JLSC, J-8)

The Joint Logistics Support Center (JLSC) has a number of on-going logistics efforts which could have significant implications for the P&L M&S efforts. JLSC is concerned with the integration of logistics support across DOD and is the focal point for the development of standard DOD logistics information systems. JLSC's needs, for modeling and simulation, appear to relate mainly to the development of M&S to help evaluate and implement policy. While this need has been identified by this workshop, there is some question of priority for funding this type of support by the DMSO. To date, there has not been an adequate interface with the JLSC to exchange information.

The Office of the Director for Force Structure, Resources and Assessment (J-8) maintains a catalog of computer models and simulations. This can be a valuable source of information for continued work in the M&S area.

OASD (P&L) can take the lead in establishing points of contact with both of these organizations. This should facilitate a continuing exchange of ideas so that (1) M&S needs that are more appropriately addressed by the JLSC can be distinguished from those to be the focus of the DMSO, (2) opportunities for joint efforts can be examined, and (3) relevant catalogued computer models may be evaluated against current M&S needs.

Communication of P&L FWG Activities

Because the P&L FWG is a new entity, its activities — including this workshop — are generally not well known. The efforts of the P&L Workshop should be brought to the attention of the JLSC and the Joint Logistics Commanders. The P&L FWG statement of needs should be circulated among government Agencies, targeting specific communities as a means of validating requirements. Also, some overall means are needed to publicize P&L participation in the DMSI. We should brief the P&L community needs to industry representatives to get their "validation" and "review."

Lack of Acquisition-Oriented Representatives

Most participants in the logistics working group were experienced in operational logistics. This bias clearly influenced the balance of the needs identified by the working group. In keeping with a "cradle to grave" logistics planning and execution concept, additional Service and Agency representatives having acquisition logistics experience need to be identified as players in the on-going M&S effort.

Verification, Validation, and Accreditation (VV&A) of Models and Databases

The Logistics working group echoed earlier DMSO concerns regarding the need to establish procedures for Verification, Validation, and Accreditation (VV&A). VV&A becomes particularly critical for high-level planning for Joint Service requirements. Working group observations centered about two needs: (1) to understand "validation" of models within the context of legal actions related to the acquisition process and (2) to establish VV&A procedures and successful models.

Technology Effects on Near/Long Term

The consensus of the working group is that technology does not appear to be a limitation in meeting any of the identified P&L community needs. The group expressed that either the technology is available today or it will be available within the next five years, defined as near term. This cursory assessment, however, must be examined in more detail as specific project proposals are identified, to address the various needs.

Policy, Management, and Technical

Overall, the needs statements produced from the working group were technical in nature and, therefore, suggest technical solutions. Clearly, these needs have broader management, and potential policy implications, which were not addressed. The group consensus was that management and policy significance is more appropriately addressed when joint M&S efforts are more clearly defined.

APPENDIX P

DEFINITIONS

DEFINITIONS

ACQUISITION LOGISTICS: Process of systematically identifying and assessing logistics alternatives, analyzing and resolving logistics deficiencies, and managing integrated logistic support throughout the acquisition process.

ANALYSIS OF MANUFACTURING OPERATIONS: The review and evaluation of assembly and fabrication processes to determine how effectively and efficiently the contractors' manufacturing operations have been planned or accomplished.

ASSEMBLY: Two or more parts or subassemblies joined together to form a complete unit, structure, or other article.

AVAILABILITY: A measure of the degree to which an item is in the operable and committable state at the start of the mission, when the mission is called for at an unknown (random) point in time.

COMPUTER-AIDED ACQUISITION AND LOGISTIC SUPPORT (CALS): CALS is a DOD and Industry strategy to enable, and to accelerate, the integration of digital technical information for weapon system acquisition, design, manufacture, and support.

CAPACITY ANALYSIS: An analysis most frequently employed in a machine or process area to project the ability to absorb additional business.

CONCURRENT ENGINEERING: A method for integrating design, manufacturing, logistics, and other disciplines into the development and production of a product.

CONSTRUCTIVE MODEL: A representation of an actual or conceptual system that involves mathematics, logical expressions, or computer simulations that can be used to predict how the system might perform or survive under various conditions or in a range of hostile environments.

COTS Equipment: Commercial-off-the-shelf equipment are items that have been produced for sale in the commercial marketplace and have been procured for use in military applications without redesign or modification.

CRITICAL DESIGN REVIEW: Determines that the detail design satisfies the performance and engineering specialty requirements of the development specification; establishes the detail design compatibility among the item and other items of equipment facilities, computer programs and personnel; assesses producibility and risk areas and reviews the preliminary product specifications.

CRITICAL MATERIAL: A material that has been classified as being essential to our economy. There are approximately 40 minerals in this category and the U.S. is more than 50 percent dependent on foreign sources for over half of these.

CUTTING SPEED: The relative velocity, usually expressed in feet per minute, between a cutting tool and the surface of the material from which it is removing stock. Synonym: cutting rate.

DESIGN TO COST (DTC): A process utilizing unit cost goals as thresholds for managers and design parameters for engineers normally in terms of a single cumulative "average flyaway cost". This cost represents what the government has determined it can afford to

pay for a unit of military equipment which meets established and measurable performance requirements at a specified production quantity and rate during a specified period of time.

DIRECT COST: Those costs which can be traced directly to a specific piece-part, subassembly or product.

DIRECT ENGINEERING: Engineering effort directly traceable to the design, manufacture, or control of specific end products.

DIRECT MANUFACTURING LABOR: Work which alters the composition, condition, conformation, or construction of the product: the cost of which can be identified with and assessed against a particular part, product, or group of parts of products accurately and without undue effort and expense; colloquially called "direct labor."

EFFICIENCY FACTOR: The ratio of standard performance time to actual performance time, usually expressed as a percentage.

EQUIPMENT: A major subdivision of a weapon system or subsystem that performs a function impacting the operational capability and readiness of the weapon system/subsystem. It is grouped into two general categories: mission equipment and support equipment. Equipment does not denote bit part pieces or components elements that comprise an equipment entity.

FABRICATION: The construction of a part from raw material.

FACILITIES: Industrial Property (other than material, special tooling, military property, and special test equipment for production, maintenance, research, development, or test) including real property and rights therein, structures, improvements and plant equipment.

FIXED COSTS: Those costs that remain relative constant irrespective of volume.

FLOW DIAGRAM: The paths of movement of workers and/or materials superimposed on a graphical representation of a work area.

FLOW PROCESS CHART: A graphic representation of the sequence of all operations, transportation, inspections, delays and storages occurring during a process or procedure.

GENERAL AND ADMINISTRATIVE (G&A) COSTS: An overhead cost category for accumulation of such costs as personnel department, accounting, purchasing, etc.

IDEF MODELING TECHNIQUES: IDEF modeling techniques were derived from the Integrated Computer Aided Manufacturing (ICAM) program sponsored by the U.S. Air Force. The acronym IDEF (pronounced *eye-deaf*) was formed from the term ICAM Definition Languages. The widely used techniques were designed to capture the processes and structure of information in an organization. IDEF0 (pronounced *IDEF-zero*) is an activity, or process, modeling technique; IDEF1X (pronounced *IDEF-one-x*) is a rule-, or data-, modeling technique.

IN-PROCESS INVENTORY CONTROL: The process whereby materials and parts are planned and controlled to assure their availability at the required stage of production.

INDUSTRIAL PREPAREDNESS: The state of preparedness of industry to simultaneously produce essential materiel and support the sustained operational requirements of U.S. and Allied Forces.

INTEGRATED LOGISTICS SUPPORT (ILS): A composite of all support considerations necessary to assure the effective and economical support of a system for its life cycle.

INTEGRATED PRODUCT AND PROCESS DEVELOPMENT (IPPD): Use of multi-functional teams established at program conception to provide interactive links to all areas (e.g., engineering, logistics, production, financial, contracting,) of a product's system design, manufacture, and use. Other terms for IPPD include concurrent engineering and simultaneous engineering. In all cases, the customer (User) is to be involved in an integrated multi-functional team as the design definition is proceeding in parallel with the manufacturing and support process definitions.

LABOR STANDARDS: A compilation of standard time for each element of a given type of work. Once element standards have been established, the standards are applied to work containing similar elements without making actual time studies of the work.

LINE OF BALANCE: A graphic display of scheduled units versus actual units over a given set of critical schedule control points on a particular day.

MACHINE-CONTROLLED TIME: That part of a work cycle that is entirely controlled by a machine, and, therefore, is not influenced by the skill or effort of the worker.

MAINTAINABILITY; The ability of an item to be retained in or restored to specified condition when maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair.

MAINTENANCE: (1) The upkeep of property, necessitated by wear and tear, which neither adds to the permanent value of the property nor appreciably prolongs its intended life but keeps it in efficient operating condition. Normally includes "repair" but in Defense, in the case of real property, is distinguished from repair through being limited to the recurrent, day-to-day, periodic, or scheduled work required to preserve or restore a real-property facility to such condition that it may be effectively utilized for its designated purpose. (2) Preventive maintenance: deter something from going wrong; or corrective maintenance: restoration to proper condition.

MANUFACTURING ENGINEERING: Preproduction planning and operation analysis applied to specific projects. Other similar functions include sustaining engineering, production engineering, and production planning.

MANUFACTURING OVERHEAD: A form of indirect costs accumulated manufacturing costs prorated over all products in process, generally as a percent of direct labor and/or material.

MATERIAL SOURCING: The process by which systems, equipments, and other items of supply are initially staged and prepared for shipment to follow-on destinations.

NDI (NON-DEVELOPMENTAL ITEM) EQUIPMENT: a. Any item of supply that is available in the commercial marketplace; b. any previously developed item of supply that is in use by a department or agency of the United States, a State or local government, or a foreign government with which the United States has a mutual defense cooperation

agreement; c. any item of supply described in subparagraphs a or b, above, that requires only minor modification in order to meet the requirements of the procuring agency; or d. any item of supply that is currently being produced that does not meet the requirements of subparagraphs a, b, or c, above, solely because of the item is not yet in use of is not yet available in the commercial marketplace.

NON-RECURRING; A descriptive term applied to a type of work, operation, part or the like that does not recur frequently or in any reasonable, regular sequence.

NUMERICAL CONTROL: Tape-controlled machine operation which provides high repeatability for multiple process steps.

OPLAN: The Operational Plan describes how a system will be integrated into the force structure, deployed, operated, and supported in peacetime and wartime.

OPERATIONAL LOGISTICS: The science of planning and carrying out the movement and maintenance of forces. In its most comprehensive sense, those aspects of military operations which deal with: (a) design and development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of materials; (b) movement, evacuation, and hospitalization of personnel; (c) acquisition or construction, maintenance, operation, and disposition of facilities, (d) acquisition or furnishing of services.

OPERATION PROCESS CHART: Identifies the successive operations, in their required sequence, for producing a product.

OPERATIONAL RELIABILITY AND MAINTAINABILITY (R&M) VALUE: Any measure of reliability or maintainability that includes the combined effects of item design, quality, installation, environment, operation, maintenance and repair.

PRODUCT DATA EXCHANGE USING STEP (PDES): The U.S. initiative to develop and use STEP (the Standard for the Exchange of Product Model Data).

PLANNING, PROGRAMMING, AND BUDGETING SYSTEM (PPBS) PROCESS: The primary resource allocation process of DOD. One of three major decision-making support systems for Defense acquisition. It is a formal, systematic structure for making decisions on policy, strategy, and the development of forces and capabilities to accomplish anticipated missions. PPBS is a cyclic process containing three distinct, but interrelated phases: planning, which produces Defense Planning Guidance (DPG); programming, which produces approved Program Objectives Memorandum (POM) for the Military Departments and Defense Agencies; and budgeting, which produces the DOD portion of the President's national budget. DOD PPBS is a biennial process starting in January of each odd numbered year with national security guidance to initiate the planning phase, and ending in January of the next odd numbered year with the President's budget submission to Congress.

PROCESS: 1) A planned series of actions of operations which advances a material or product from one stage of completion to another, and 2) a planned and controlled treatment that subjects materials to the influence of one or more types of energy for the time required to bring about the desired reactions or results.

PRODUCTION ENGINEERING: The application of design and analysis techniques to produce a specified product. Included are functions of planning, specifying, and coordination the application of required resources; performing analyses of producibility and production operations, processes, and systems; applying new manufacturing

methods, tooling, and equipment; controlling the introduction of engineering changes; and employing cost control techniques.

PRODUCIBILITY: The relative ease of producing an item or system which is governed by the characteristics and features of design that enable economical fabrication, assembly, inspection, and testing using available production technology.

RELIABILITY AND MAINTAINABILITY (R&M) ENGINEERING: That set of design, development, and manufacturing tasks by which reliability and maintainability are achieved.

RELIABILITY: The duration or probability of failure free performance under stated conditions.

SOFTWARE FAILURE: The inability, due to a fault in the software, to perform an intended logical operation in the presence of the specified/date environment.

SOFTWARE MAINTAINABILITY: The probability that the software can be retained in or restored to a specified status in a prescribed period compatible with mission requirements.

STANDARDIZATION: The process by which various Defense forces achieve the closest practicable cooperation and the most efficient use of research, development and production resources.

STANDARD FOR THE EXCHANGE OF PRODUCT MODEL DATA (STEP): STEP expands the capability to include the exchange of additional types of product data, e.g., materials, tolerances, and product structure, and adds the ability to share this data within integrated enterprise systems.

SUSTAINMENT: The "staying power" of U.S. forces, units, weapons systems and equipment, usually measured in number of days capability to sustain combat.

*TACTICAL/OPERATIONAL/STRATEGIC:

TOLERANCE: A measure of the accuracy of the dimensions of a part or the electrical characteristics of an assembly.

VARIANCE: The difference between any standard or expected value and an actual value. For example, the difference between the established standard cost and the cost actually incurred in performing a job or operation.

VIRTUAL MODEL: A computer-based simulation of a system or subsystem with a degree of functional realism that is comparable to what would be available from a physical prototype designed for an expressed purpose.

---

* Indicates definition cannot be referenced or needs to be generated

VIRTUAL MANUFACTURING: The coordinated use of multiple computer applications to generate, quickly and at low cost, a detail level of product definition currently achieved only through prototypes and commitment to full scale development.

VIRTUAL PROTOTYPE: A computer-based simulation of a system or subsystem with a degree of functional realism that is comparable to what would be available from a physical prototype designed for an expressed purpose.

VERIFICATION, VALIDATION, AND ACCREDITATION: The total process by which a computer model or simulation is measured against a standard, independently authenticated, and certified for use.